NOVEMBER 15, 1954

Practicing engineers see ERS on page 146

Electrical World

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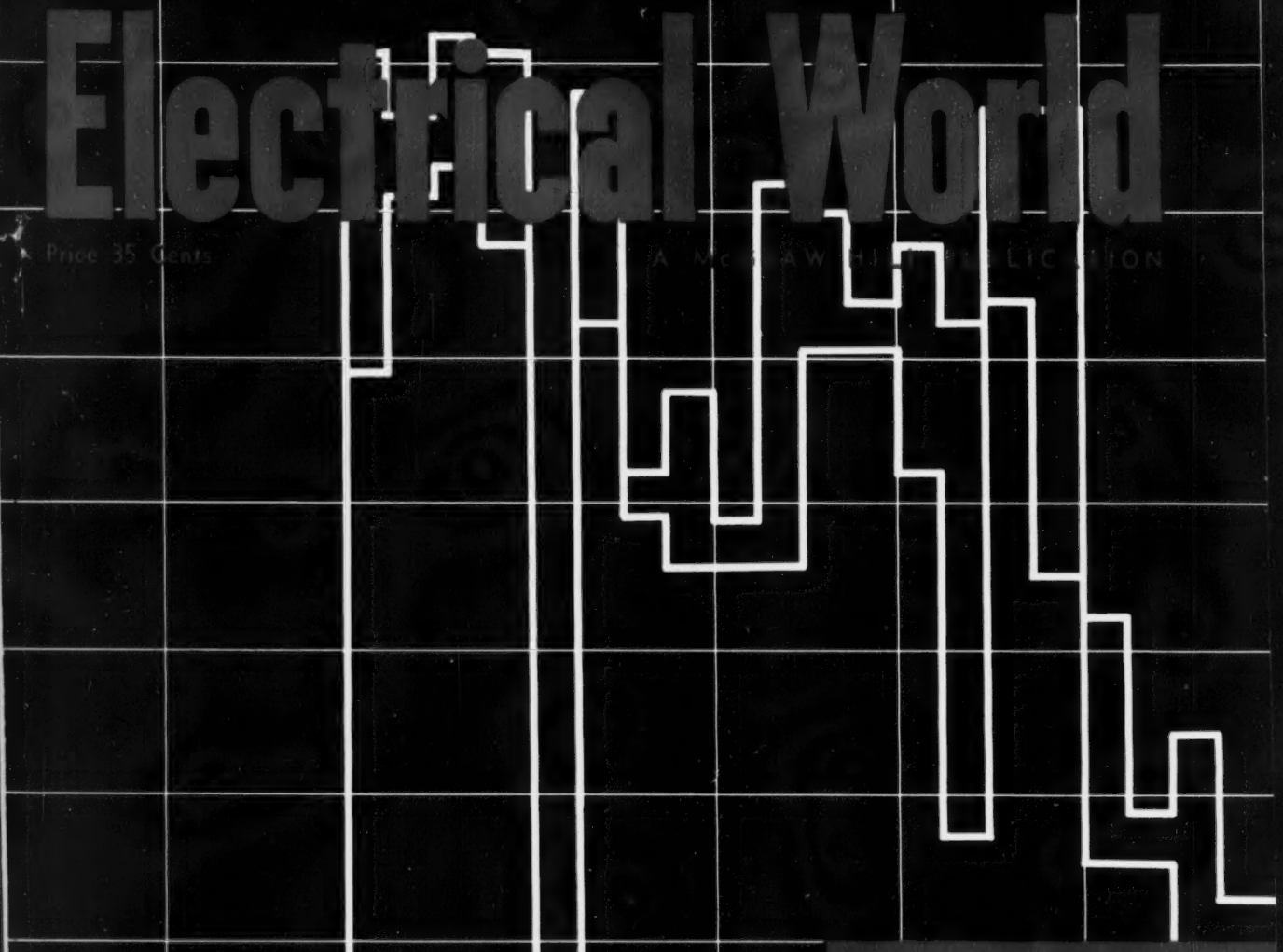

The What, Why, and Where of Philadelphia Electric's Supercritical-Pressure Installation . . . page 114

The Heat Pump: Its Progress and Performance

see page 120

Moloney HiperCore Distribution Transformer sealed-tank construction has won the seal of approval from operating engineers. No air or moisture can enter . . . greatly increasing life of oil and insulation. To assure this perfect, lasting seal which protects these HiperCore Transformers, Moloney uses a resilient Corprene gasket that is held in place by a welded-in retainer ring. Corprene makes a positive seal . . . impervious to oil, gas, moisture . . . it conforms to tank top and lip contours. Though tightly compressed to make a leak proof seal, the uncemented gasket retains resiliency for years . . . can be reused if ever required.

Part by part, Moloney HiperCore Transformers offer you "dependable service," . . . the mark of Moloney equipment for 58 years.

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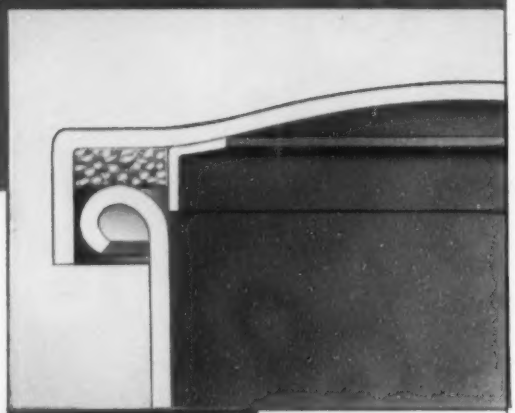
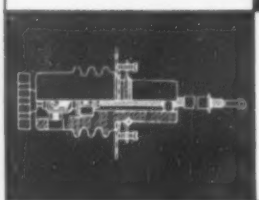


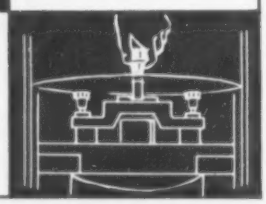
Tank base bonded to shell by continous seam weld to protect against handling and weather. Inside edge coated with sealing mastic and rolled in to form lasting barrier against moisture, air and rust.

Low voltage bushings keyed to fit into notched hole in tank wall, thus lineman, tightening connections cannot rotate bushing, eliminating danger of accidential contact between "hot" lines.



Moloney sidewall mounted high voltage bushings are provided with a molded, high impact resistant phenolic-cold rubber protective cap for working "hot".

Tap changer operating handle located above hot oil level. Double-moving contacts snap into position with a wiping action to assure positive contact.



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Electrical World

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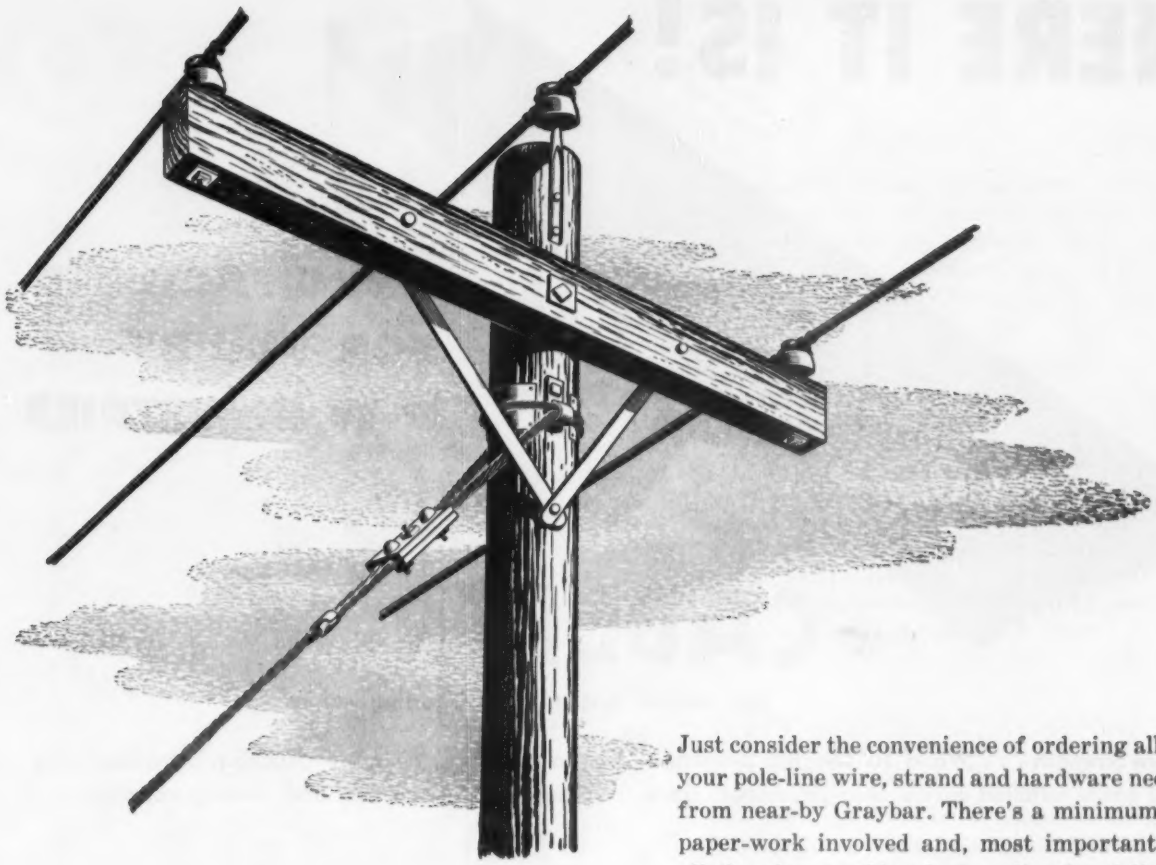

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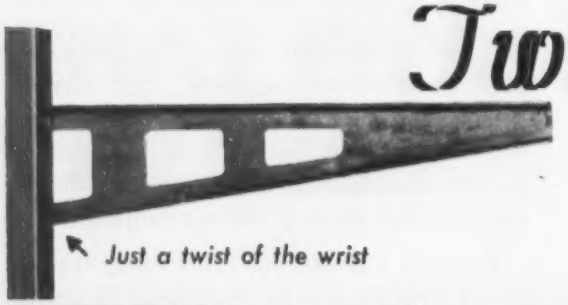

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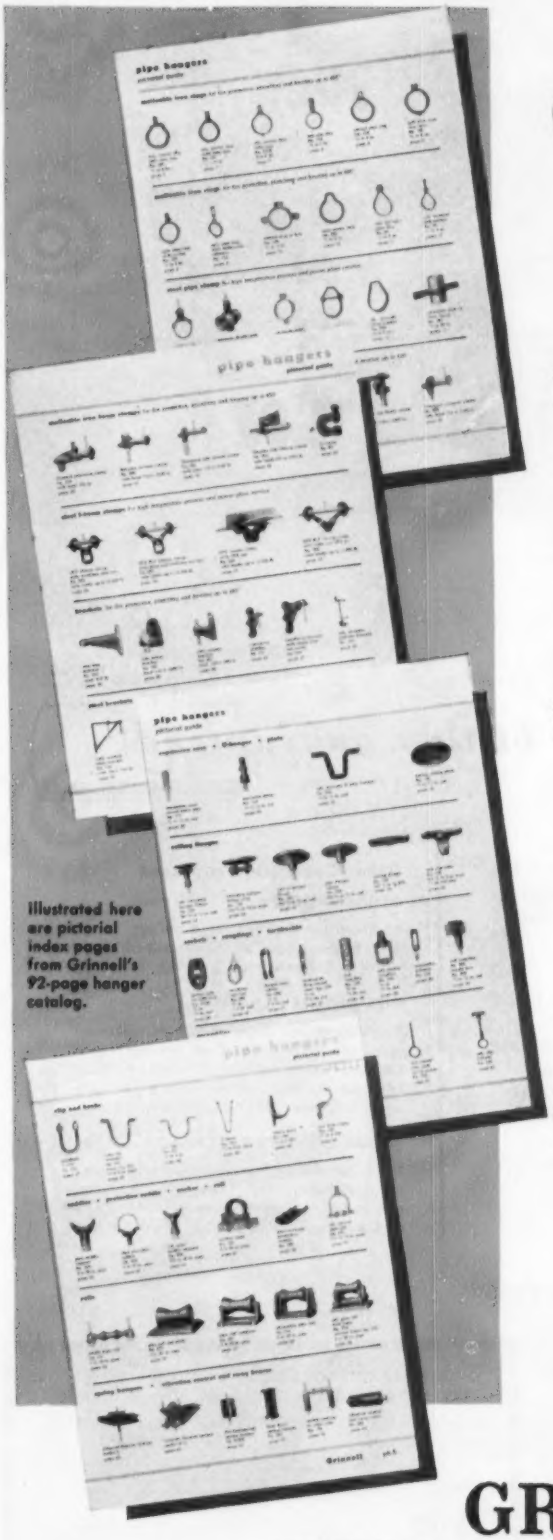

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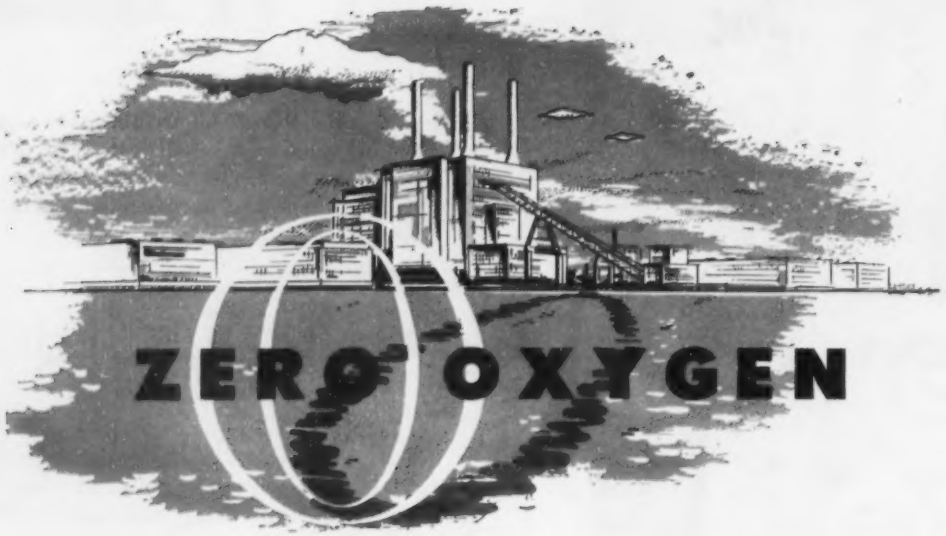

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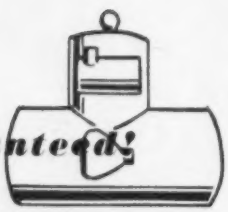

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Says Mr. HARRY METTENDORFF, Superintendent
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Read Mr. Mettendorff's letter. It's typical of the dependable performance reported by thousands of Copperweld* users.

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WESTFIELD, NEW YORK

Copperweld Steel Company
Glassport, Pa.

Gentlemen:

We began using Copperweld conductors over thirty years ago when we first started extending our lines beyond the village limits. We are more than satisfied with their exceptional performance and economy.

Today, we serve the entire township, using many miles of Copperweld. We have found we need relatively few poles per mile and Copperweld has plenty of strength for storm loadings. The conductivity is good and maintenance costs are practically negligible. Even after more than 30 years' service, our original Copperweld conductors are still in good condition.

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Sincerely,

Harry Mettendorff

Harry Mettendorff
Superintendent

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P. S. Because our guy replacements were costing us too much, we started using Copperweld strand about fifteen years ago. We are happy to report it has not been necessary to replace any of these Copperweld guys.

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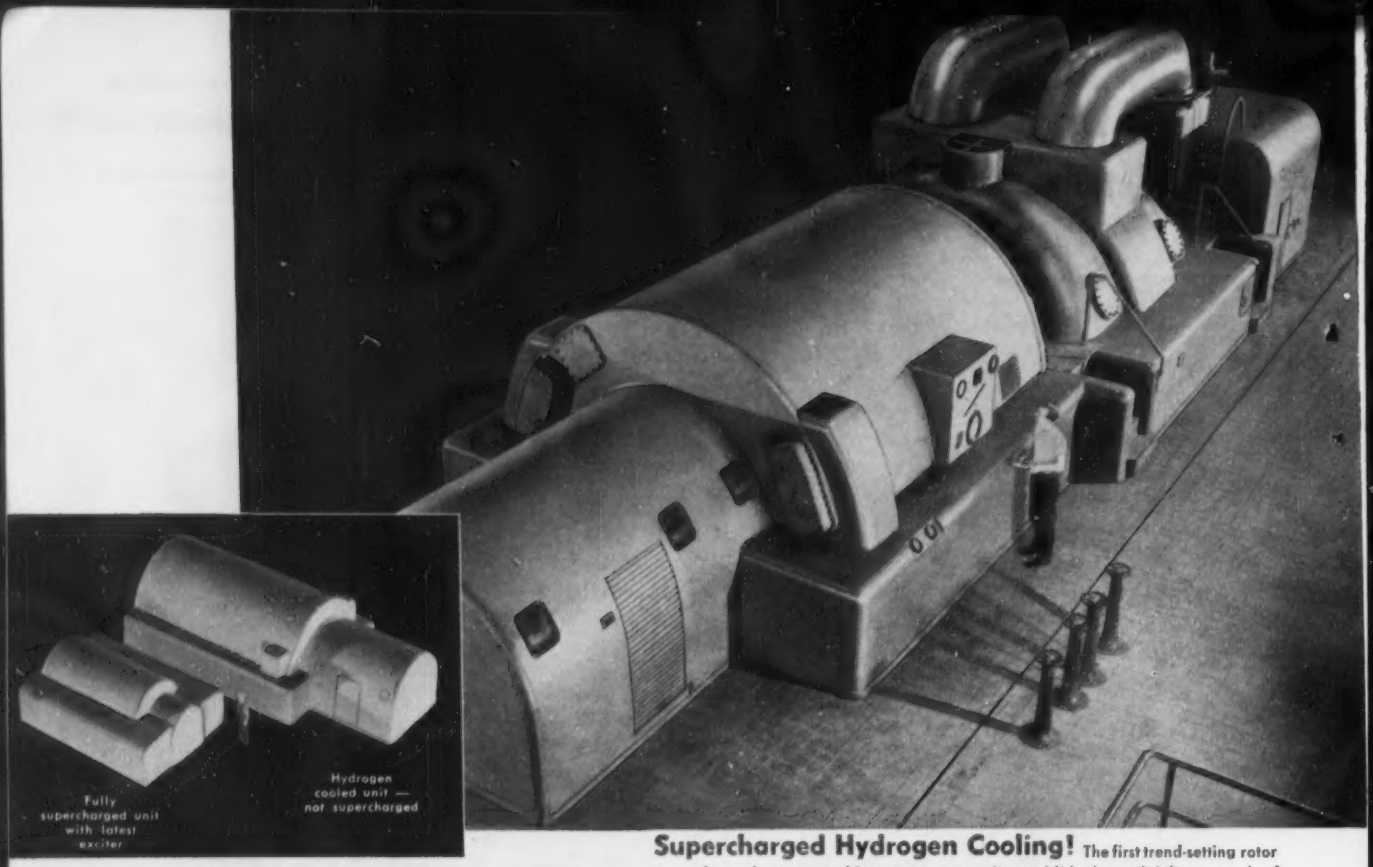

Supercharged Hydrogen Cooling! The first trend-setting rotor supercharged steam turbine generator unit established availability record of 99.86% during first two calendar years. Models of generators at left clearly show relative size reduction obtainable with fully supercharged cooling.

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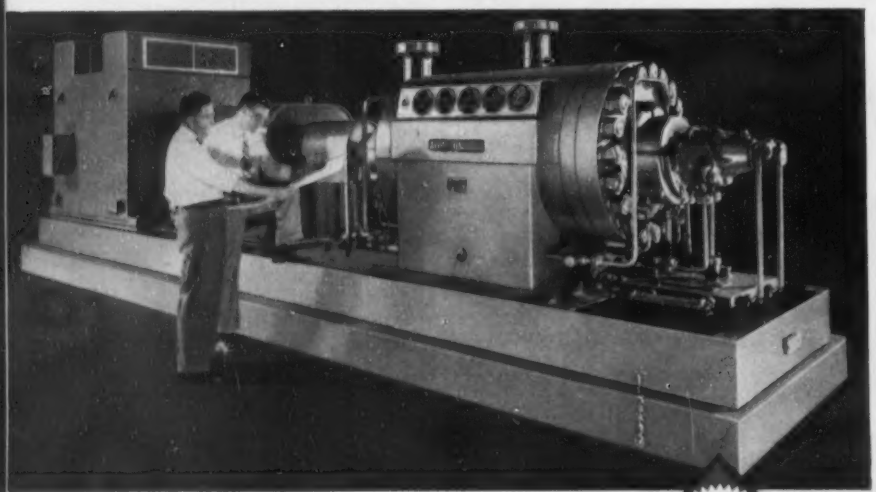
Here are just a few of the many developments introduced by Allis-Chalmers in the last few years for the fast-moving utility industry. For information on any of these items call your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin.



Developments in Motors and Pumps for Boiler Feed Service

Redesigned Two-Pole Motor — Top air intake and discharge *plus* spiral stator core ventilation are now featured. Top air discharge permits closer mounting of motors. Spiral ventilation assures even internal cooling... helps reduce noise. In addition, motor has modern appearance and new capsule-type bearings are provided.

Latest Boiler Feed Pump — Recent refinements include simplified oil piping arrangement and lagging around barrel to permit insulation of barrel and provide improved appearance. Pump is barrel-type for high efficiency, high pressure service. Single stage back-to-back impellers balance axial forces without use of balancing drum. Double volute casings balance radial forces.

Pneu-Draulic is an Allis-Chalmers trademark.

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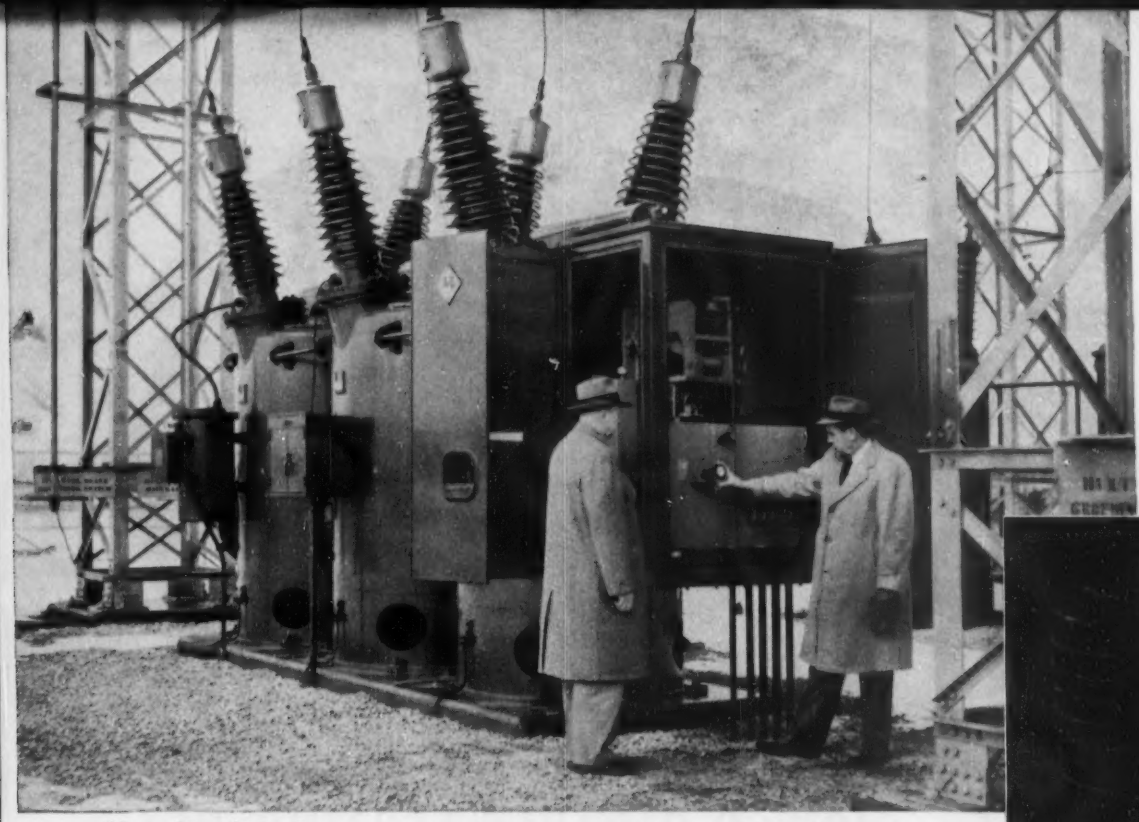
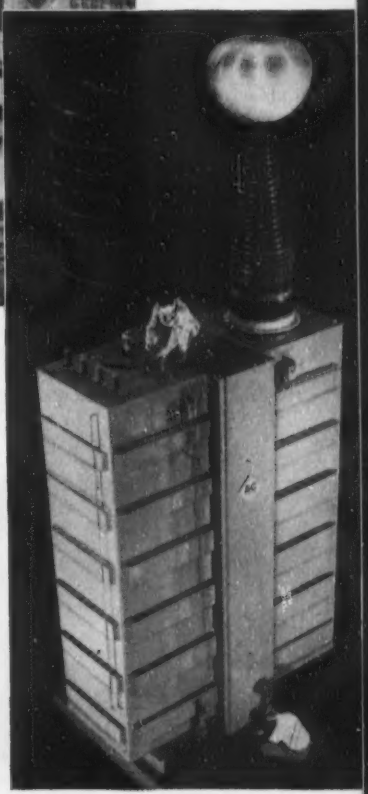
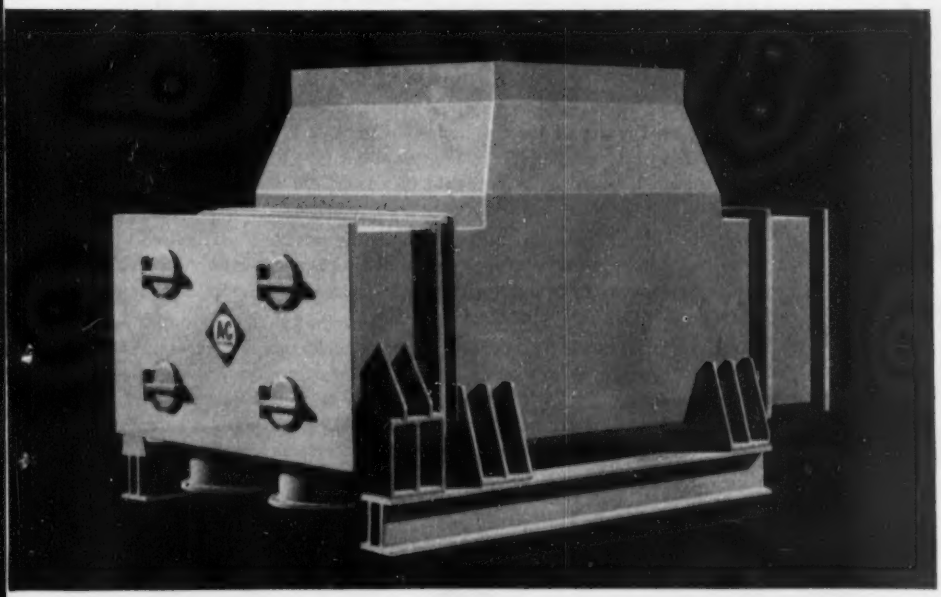


New Simplicity! *Pneu-Draulic* operating mechanism for breakers utilizes hydraulic principle instead of air. This reduces dirt and moisture hazards, adds reliability to breakers. These 115-kv breakers with *Pneu-Draulic* operators have been in service more than a year.

Developments



A Look At Tomorrow!
This 5000-kva power transformer, designed for 600 or 800-kv service, was built to help advance engineering knowledge toward possible future requirements.



Space-Saving Condenser! Latest 100,000-square-foot condenser, now being built, illustrates trend to rectangular shape, which permits savings in plant construction cost. Model allows unusual view of unit. This condenser features multi-steam path design for low "terminal difference," high condensate temperature and low absolute pressure.

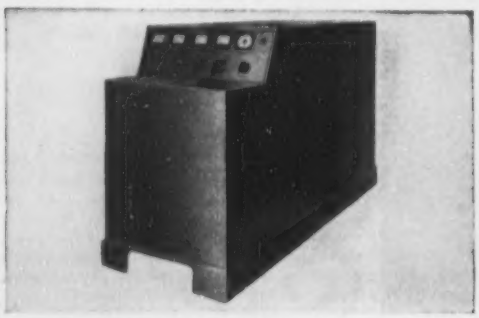
A-4484

CHALMERS

PORTABLE test set has four wheels, equipped with roller bearings for smooth, easy handling.

GENERAL ELECTRIC'S D-C CABLE-TESTING SET IS SAFER, MORE ECONOMICAL

MOBILE set is mounted in a road trailer. The versatility of this equipment can be greatly increased by the addition of a fault-locating set.



STATIONARY set, rated 50 kv, 250 ma, has fully enclosed housing. It is ideal for a substation location.

To help protect the operator, General Electric's 50-kv d-c cable-testing set is fully enclosed—has an all-steel, dead-front panel. The high-voltage terminal for connecting to the cable is located at the rear of the cabinet, far from the operator, where it can easily be protected from accidental contact. Each set is provided with a discharge switch to automatically ground both the set and the cable under test when the set is de-energized.

It is economical to use a d-c set for installation acceptance and periodic cable tests, because of the low charging currents required, thus keeping the demand on station auxiliary power to a minimum. For this 50-kv set, the 230-volt power demand is only about 3 to 4 kw. Furthermore, because it is available in either 100 ma or 250 ma capacities, this same set is effective for fault reduction.

More and more utilities are finding G-E testing sets the ideal method for checking the condition of their cables. A simple comparison of the leakage current measured during periodic tests with that obtained during the original acceptance tests tells the story.

Available in stationary, portable or mobile models, this set has many features which contribute to its safe, economical operation. For more information about the 50-kv set or other G-E cable-testing units in ratings of 75 to 375 kv contact your nearest G-E Apparatus sales office or write for Bulletin GEA-4595. Address General Electric Company, Section 422-18, Schenectady 5, New York.

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This 400,000 KW station produces 2,600,000 lb./hr. of steam at 1450 psig.

Permutit Demineralizers deliver highest quality make-up... and save money, too!

Albany Station's Mixed-Bed Demineralizer was guaranteed to produce make-up of not over 0.5 ppm total solids (about 1 micromho in conductivity), silica of not over 0.1 ppm. It is consistently delivering *better* make-up—0.1 to 0.3 micromhos in conductivity, silica of 0.03 ppm.

Operators are enthusiastic! They like the availability of this Permutit Demineralizer. It is independent of the heat cycle—supplies plenty of make-up for filling a boiler after a shutdown, delivers water at low loads when evaporators would not be available.

Automatic Regeneration saves money! High-capacity Permutit ion exchange resins require fewer regenerations. Motor-driven valves automatically backwash and separate the two resins, individually regenerate and rinse the beds, evenly blend the resins and return the unit to service. Operators have only to keep charges of regenerating chemicals ready.

For performance and cost data on this installation or aid in solving your water problem, write The Permutit Company, Dept. EW-11, 330 West 42nd Street, New York 36, N. Y., or Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

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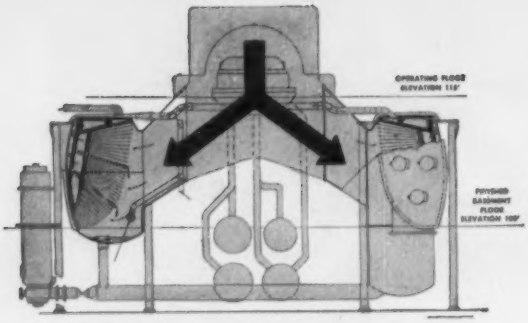
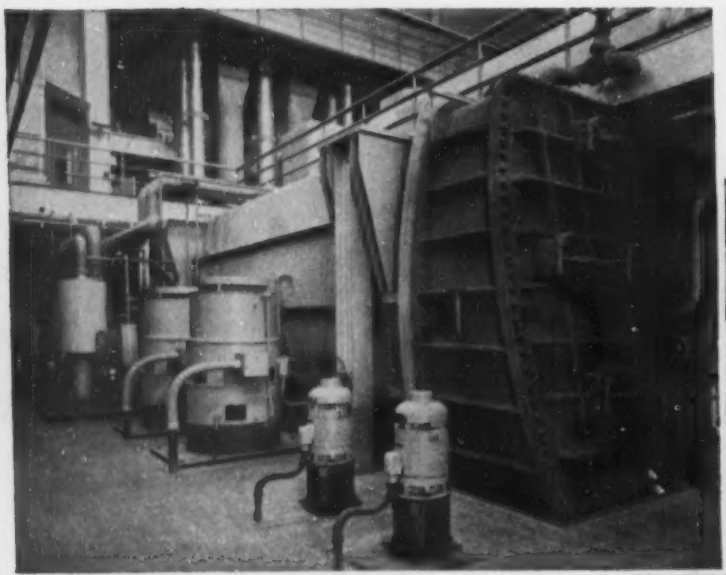
PERMUTIT®

new angle

in turbine-exhaust-condenser arrangement

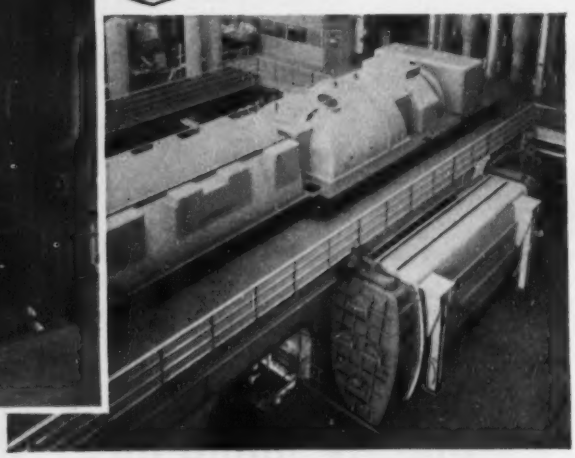


saves headroom and construction costs at Kearny Generating Station



One of the FW side-mounted condenser shells from basement level, showing deflection columns, condensate pumps and heater drain pumps.

General view of turbine room at Kearny station, showing one of the twin condenser shells and the side-exhaust turbine.



The slightly unorthodox surface condenser illustrated above is one of two 70,000 sq. ft. side-turbine-exhaust units designed and built by Foster Wheeler for Public Service Electric and Gas Company, N. J. Serving a 145,000 kw turbo generator at the new Kearny Generating Station, it has effected important overall economies in station construction.

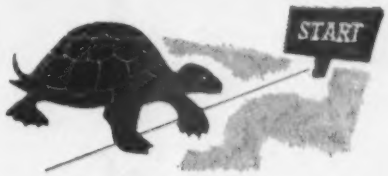
Total height from basement level to turbine operating level is only 15 feet. This low height was achieved without appreciable increase in turbine discharge path, which feeds directly into the twin single-pass condenser shells through a short divided exhaust piece. Careful studies showed that the reduction in headroom was a definite economic advantage. The space below the exhaust piece is effectively utilized by four feedwater heaters.

Each half of the condenser shell is suspended from four deflection columns which allow for thermal expansion without the customary expansion joint or spring arrangement.

Specializing in the design and construction of steam generators, surface condensers and feedwater heaters, Foster Wheeler is fully equipped, engineering and productionwise, to meet your requirements for the modern steam plant. For further information write for HE-3-54. Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.

FOSTER WHEELER

even in
an age of speed...
sheer velocity is not
always an asset...



...in fact
there are some
instances...

...where it's
a real
liability!

take low disc speed in a meter . . .

Speed is definitely not an asset in the turning rate of a watt-hour meter disk.

That's why the disk in the Sangamo J2 Watthour Meter revolves at a low, low rate of speed—only 10 revolutions per minute at the nameplate rating of 15 amperes. And only 66⅔ revolutions per minute or approximately one revolution a second when the J2 is busy measuring a full load of 100 amperes. Yet the J2 has exceptionally high driving power.

This means the Sangamo J2 lasts longer and requires less maintenance than ordinary meters . . . there's less wear on all moving parts.

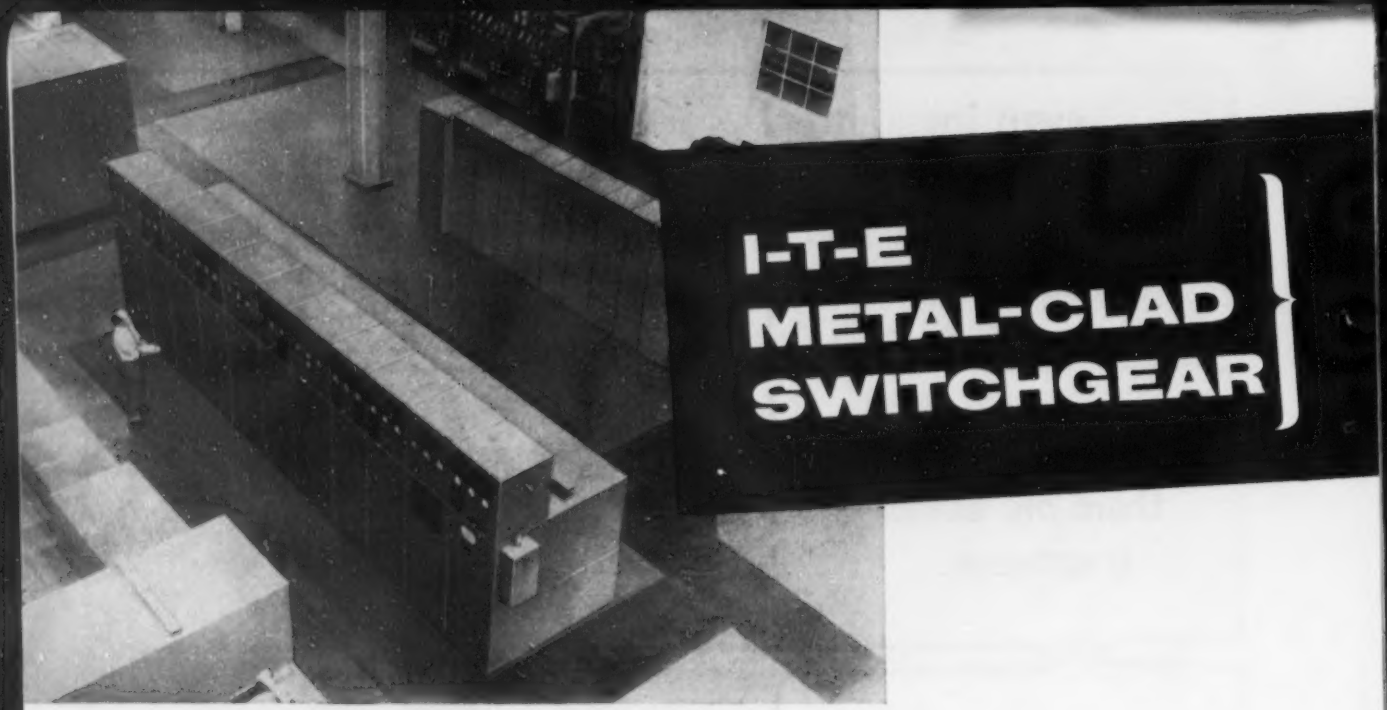
It means good public relations, too. Mr. Customer doesn't like to see his meter spin.

A METER WITH STRAIGHT LINE ACCURACY

UP TO 100 AMPERES

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

JM54-10



I-T-E METAL-CLAD SWITCHGEAR

Your metal-clad switchgear is a *vital* purchase. That's why you should take advantage of the many advanced engineering features of I-T-E quality equipment. They add up to a sound investment which pays *extra* dividends for years and *years* in maximum electrical protection, control, and service continuity.

I-T-E air circuit breakers are the heart of your switchgear. With an I-T-E HV breaker you get *positive arc interruption* —the ultimate in air breaker performance. In just one instant of its lifetime, this rugged device can repay its cost many times over. In addition to superior breakers, the modern I-T-E switchboard incorporates the highest quality components and accessories.

I-T-E metal-clad switchgear is completely factory-assembled and -tested *before* it arrives at the installation site. Tight construction schedules are met by dimensionally accurate assemblies which need only be brought to their location and connected according to plan.

I-T-E extra-service benefits include application engineering aid in (1) selection and application of equipment, (2) preparation of specifications, and (3) coordination of all job requirements.

RATINGS

2400, 4160, 7200, 13,800 volts a-c
50,000 through 500,000 KVA interrupting
600 through 2000 amperes continuous

For details, contact the I-T-E field office nearest you. Look in your classified directory under "Electric Equipment," or write for Bulletin 7004B.

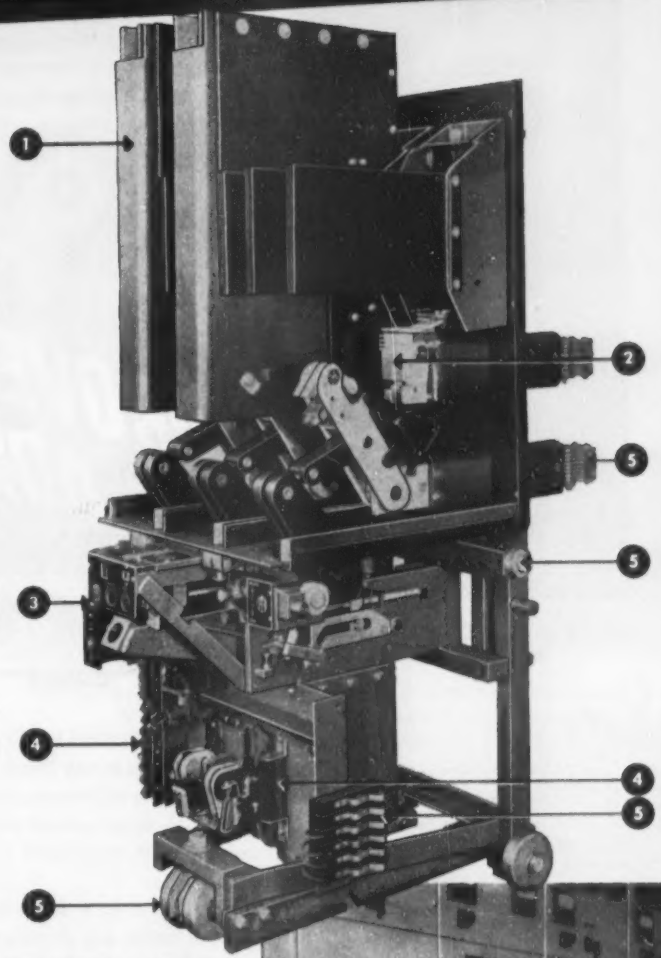
THE SYMBOL OF QUALITY SWITCHGEAR

I-T-E CIRCUIT BREAKER COMPANY

19th AND HAMILTON STS., PHILADELPHIA 30, PA.

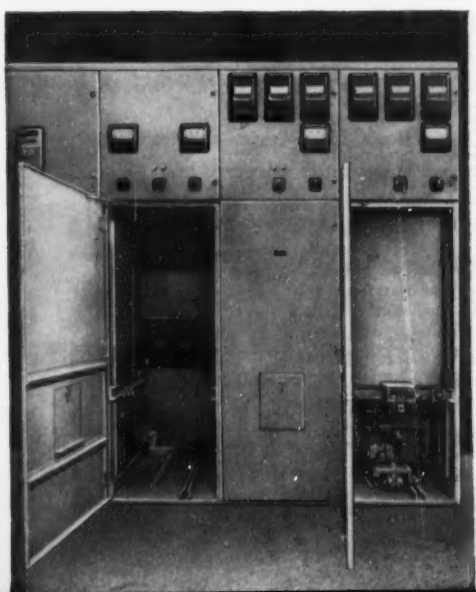
METAL-CLAD SWITCHGEAR

engineered for •Protection •Safety •Accessibility



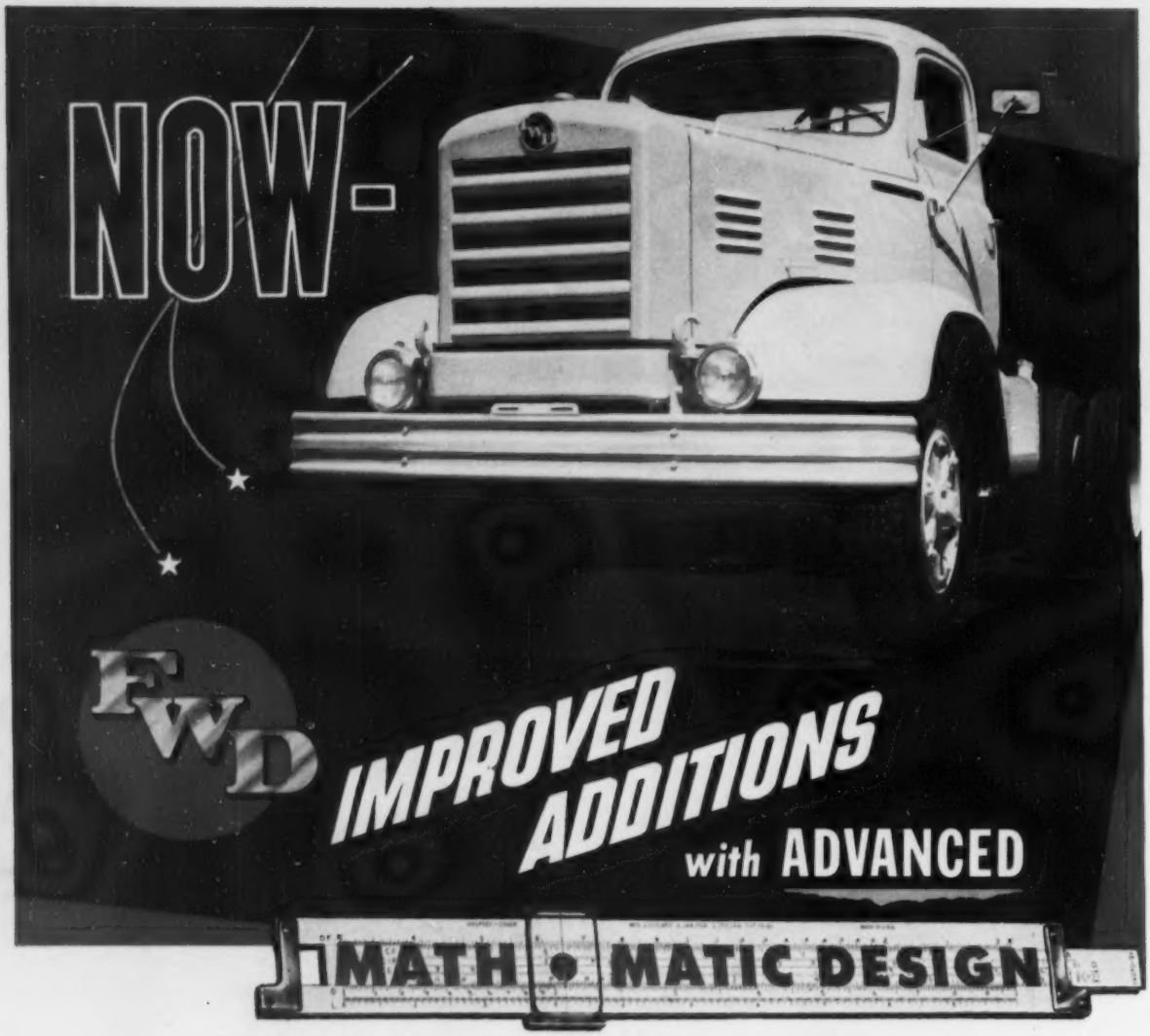
CHECK THIS ADVANCED I-T-E ENGINEERING:

1. **Positive arc interruption** is provided by carefully designed arc chutes, contacts, and blowout irons.
2. **Sturdy main and arcing contacts** are designed to minimize wear and deterioration due to arcing.
3. **Simplified testing** is achieved by centralizing electrical test button, manual trip button, breaker positioning device, and emergency breaker closing handle.
4. **Easy inspection and maintenance** is afforded by readily accessible secondary control relays, rectifiers, auxiliary switches, and separable contacts.
5. **Truck-type horizontal drawout** is facilitated by precision-made guide wheels, bar, and self-aligning contacts.



TO TEST BREAKER quickly and safely operator works through small auxiliary door—from *outside* compartment. Other safety features include complete interlocking of breaker operation, segregation of circuit wiring, proper venting of arc gases, and utilization of correct insulation materials.

ACCESSIBLE COMPARTMENT DESIGN features wide-opening doors. Withdrawal of breaker closes grounded, steel shutters to protect personnel. Metal partitions completely segregate compartments. Instruments and relays are fully isolated from breakers, safe from jar and vibration—protecting against damage and false operation.



Every pound *helps haul itself* on these advanced FWD trucks. That's because it's "working weight." Improved Math-Matic Design—*exclusive* on FWD's—correctly proportions power to weight on front and rear axles. Each wheel's load makes it *grip harder*, using every ounce of power for greater controllable traction *on* or *off* the road.

From 30 to 37% longer tire life* . . . up to 82% more tractive ability* . . . safest by far to operate under *any* driving conditions* . . . all these extra values without extra fuel consumption—here are dollar and *sense* reasons why *you* should get full facts immediately on this greatly advanced line of heavy-duty trucks. Four-wheel-drive and six-wheel-drive models for any "truck-killing" job

- ★ **Greater power-weight ratio, higher RPM, thru new engine design!**
- ★ **Lower maintenance costs because of standardized parts!**
- ★ **Larger legal payload thru better weight distribution!**
- ★ **New comfort—convenience—safety in completely redesigned cab!**

*TRUCK RESEARCH PROJECT CONCLUSIONS

Write now for your free copy of "The Truck That Went To College."

FWD MATH-MATIC DESIGN

BUILDERS OF AMERICA'S FOREMOST HEAVY-DUTY TRUCKS

THE FOUR WHEEL DRIVE AUTO COMPANY, CLINTONVILLE, WISCONSIN, *Canadian Factory,* KITCHENER, ONTARIO

it's here!

THE GREAT POWER-LOAD BUILDER FOR MANY YEARS TO COME...

the key to ALL-ELECTRIC LIVING

WEATHERTRON

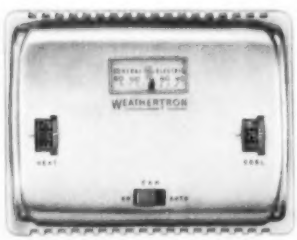
automatic • ALL-ELECTRIC • air-to-air

G-E HEAT PUMP

SINGLE UNIT THAT COOLS IN SUMMER, HEATS IN WINTER, FILTERS AND CONDITIONS AIR—AND BUILDS YOUR REVENUES—365 DAYS A YEAR

REVOLUTIONIZES INDOOR HEATING AND COOLING. Here's what everybody's been waiting for—completely automatic, completely dependable indoor weather for homes, commercial and industrial buildings with the comfort, cleanliness, convenience and safety of ALL-ELECTRIC OPERATION.

HERE'S WHY MORE AND MORE HOMEOWNERS AND BUSINESSMEN WILL WANT "ALL-ELECTRIC" COMFORT NOW! Single, attractive indoor unit needs no fuel or water. ★New cleanliness—no flame, no soot or odors. ★Gentle, draft-free circulation of clean, filtered air. ★Humidity kept at proper level the year round. ★Permits freedom of home design—can be located in cellar, closet, or utility room. ★Requires no expensive structural alterations or "extras", no unsightly watertowers, ground coils, wells, or pumps. ★No chimneys or flues to build and maintain, no fuel problems. ★For new and remodelled structures. ★Factory assembled—no job assembly cost. ★Requires no costly "change-overs" or seasonal attention.

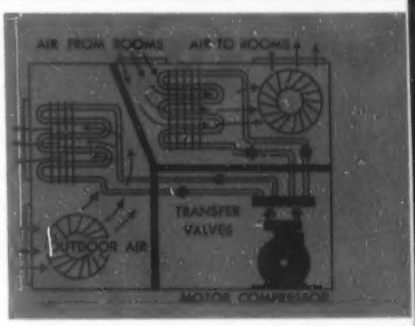


WEATHERTRON Two-Way Thermostat

Owner simply sets heating and cooling temperatures, then forgets the weather completely. Unit is entirely automatic in switching from heating to cooling and back again as the weather changes.

HERE'S HOW WEATHERTRON WORKS

Indoor air is drawn over "indoor coil" which is either cooled by refrigerant's expansion or heated by its compression. Clean, conditioned air at the right temperature is then circulated. "Outdoor coil" discharges heat to outdoor air when unit is cooling, or cools outdoor air during indoor heating cycle. Unit is thermostatically controlled, reverses itself automatically.



★Comes in sizes for any home or office; multiple installations are efficient and practical.

WEATHERTRON MAKES IT EASY TO SELL "EVERYTHING ELECTRIC." Handling the entire job of home heating and cooling, a Weathertron uses from 10,000 to 16,000 KWH a year—by far the biggest power load in the home. A G-E Weathertron practically assures the use of an electric water heater, range, dryer, and other electrical appliances that build meter loads for you.

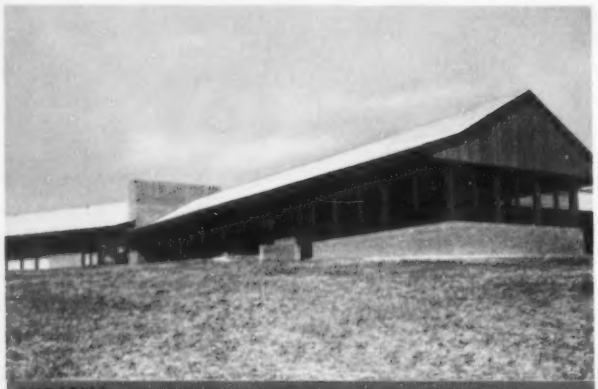
it's proved!

IN HOMES OF ANY SIZE OR ANY CONSTRUCTION

THE G-E WEATHERTRON is a product of 20 years of research, development, and improvement by the General Electric Company, the world's leading electrical manufacturer. Installations in new and old homes in many parts of the country have proved the complete practicability, efficiency, and dependability of the Weathertron for maintaining ideal indoor temperature and humidity conditions regardless of the weather outside. We now have "Pushbutton Weather" – without even pushing a button.

The Weathertron is housed in a simple, attractive cabinet that looks well in space, or it can be concealed. It requires relatively little floor area. The only connections required are simply a power supply, ducts, and a drain for condensate. Its source of outdoor air can be readily louvered or located out of sight.

Homeowners value the tremendous increase in work-free, carefree year-round comfort it brings. And often, by capitalizing on the savings it offers—in doing away with the necessity for flue and chimney construction, fuel storage space and fuel tanks, cooling towers, attic fans, screens, and porches—owners are able to balance off an appreciable part of the cost of their heating and cooling system.



INDIANA. Weathertron provides ultimate in heating and cooling for all-electric home.

TENNESSEE. Weathertron insures "perpetual springtime" in physician's 9-room residence.

CALIFORNIA. Family room—garage houses Weathertron. No fuel storage, no watertower problems.

TEXAS. Family did not know "real comfort" till Weathertron was installed.

GEORGIA. Owner has high praise for Weathertron's performance and economy.

and accepted!

BY BUSINESSMEN AS THE IDEAL MEANS OF HEATING AND COOLING

Wherever the Weathertron has been used—in offices, stores, motels, restaurants, clinics, factories, clubs—owners are lavish in their praise of its effectiveness, cleanliness, safety and operating economy. In many commercial and industrial establishments, the Weathertron is able to compete successfully with ordinary forms of heating and cooling on an operating cost basis.

Businessmen appreciate the year-round advantage of having completely automatic heating and cooling from a single compact packaged unit, with no between-seasons service bills for cleaning out the system, starting up cooling and shutting down heating, or vice versa.

Better business and more efficient working conditions result from Weathertron's ideal indoor climate every month of the year. The clean filtered air it circulates protects products and cuts cleaning bills, too.

In multiple installations, Weathertrons give unique flexibility to meet varying conditions throughout the building, without using complex controls or unsightly, expensive piping. If desired, one area can be cooled while another is heated. Operating costs are surprisingly low, especially for larger users of electricity.

VIRGINIA. Electric Utility estimates 17 Weathertrons save 30% annually over conventional heating-cooling of 25,000 sq. ft. factory.

SOUTH CAROLINA. 179 year old architects' office has Weathertron for modern-as-tomorrow "automatic weather."

FLORIDA. Restaurant finds healthful air conditioning by Weathertron boosts patronage and profits.

TEXAS. Hardware store owner avoids unsightly cooling tower—likes Weathertron safety and cleanliness.

ALABAMA. Weathertrons assure quiet, out-of-sight heating and cooling for new luxury motel.

it's ready!

LET THE WEATHERTRON GO TO WORK FOR YOU BRINGING IN

MANY MORE DOLLARS PER METER

This is the time to lay the foundation for a growing revenue now—and in years to come—with

WEATHERTRON

FORMERLY G-E HEAT PUMP

The Weathertron is not a Utopian dream for the future—it's here *now*, helping a number of utilities get a planned, *year-round* power output on a much higher consumption level per meter. Residential, commercial and industrial customers need and want trouble-free automatic heating and air conditioning. With Weathertrons on your lines you get the *entire* heating and cooling dollar, a large part of which was previously paid for gas, oil or coal. You have an airtight argument for "all-electric living" which in its turn means a further boost in electrical revenue. Our own experience and research studies lead us to predict that in the next ten years heat pumps will far outstrip any electrically-powered device as a load builder for electric utilities.

LET'S TALK IT OVER

We'd be glad to give you a practical, profitable, first-hand answer to these questions:

1. What can you do about a rapidly increasing summer peak?

2. How can you increase residential load by a substantial amount?

3. Are you getting a maximum return from your investment in distribution pole lines?

4. Do you have a balanced commercial load?

5. Are you taking full advantage of G-E facilities to explore the load-building possibilities of Weathertrons in the area you serve?

We would welcome the opportunity to discuss Weathertrons with you as a progressive utility, based on your own system characteristics and capacities, and the experience of utilities now handling Weathertrons. Simply drop us a line, and we will be happy to have a thoroughly qualified representative get in touch with you. General Electric Company, Weathertron Department, 5 Lawrence St., Bloomfield, N. J.

Progress Is Our Most Important Product

GENERAL ELECTRIC

RE 77-2951 12M (104) PRINTED IN U. S. A.

New **BOSCH** Builder's Hammer

GERMANY

with power rotation... weighs only **21** lbs.

Here's a new electric hammer . . . imported from Germany and sold exclusively by Homelite . . . that will cut costs on installation work. Weighing only 21 pounds . . . much lighter than other hammers . . . this compact, rugged tool will smash, cut, chisel, channel and drill through concrete, brickwork or stone *fast*. What's more, with its unique power rotation feature it needs no hand crank drive for drilling. That's right! It's both an impact and rotating tool. Easy to operate . . . even in close quarters . . . this low cost hammer is available with either high cycle or standard universal drive. Operation is by normal power or by power from a Homelite Dual Purpose Gasoline Engine Driven Generator. Write for a free demonstration.

PERFORMANCE · DEPENDABILITY · SERVICE

HOMELITE

CORPORATION

6111 RIVERDALE AVENUE • PORT CHESTER, N. Y.

Manufacturers of Homelite Carryable Pumps • Generators • Blowers • Chain Saws

Canadian Distributors: Terry Machinery Co., Ltd., Toronto, Montreal, Vancouver, Ottawa

MOISTURE is Permanently SEALED OUT of Liner in

BLACKBURN Parallel Groove CLAMPS

NEW PROCESS ELIMINATES USE OF SOLDER
Aluminum body is pressure cast around pronged copper liner—no moisture trapping voids or corrosive fluxes between liner and body to foster galvanic corrosion.

HIGH CONDUCTIVITY
Special surface treatment of under side of copper liner reduces surface tension of the molten aluminum—establishing a low-resistance contact between the two metals.

CORROSION RESISTANT
Aluminum bodies are cast of a highly corrosion-resistant alloy. The steel bolt, nut and lockwasher are hot dipped galvanized. Also available with aluminum hardware.

ONE PIECE CONSTRUCTION
No loose parts to assemble during installation—clamp bodies cannot be mated incorrectly—copper inserts always face each other.

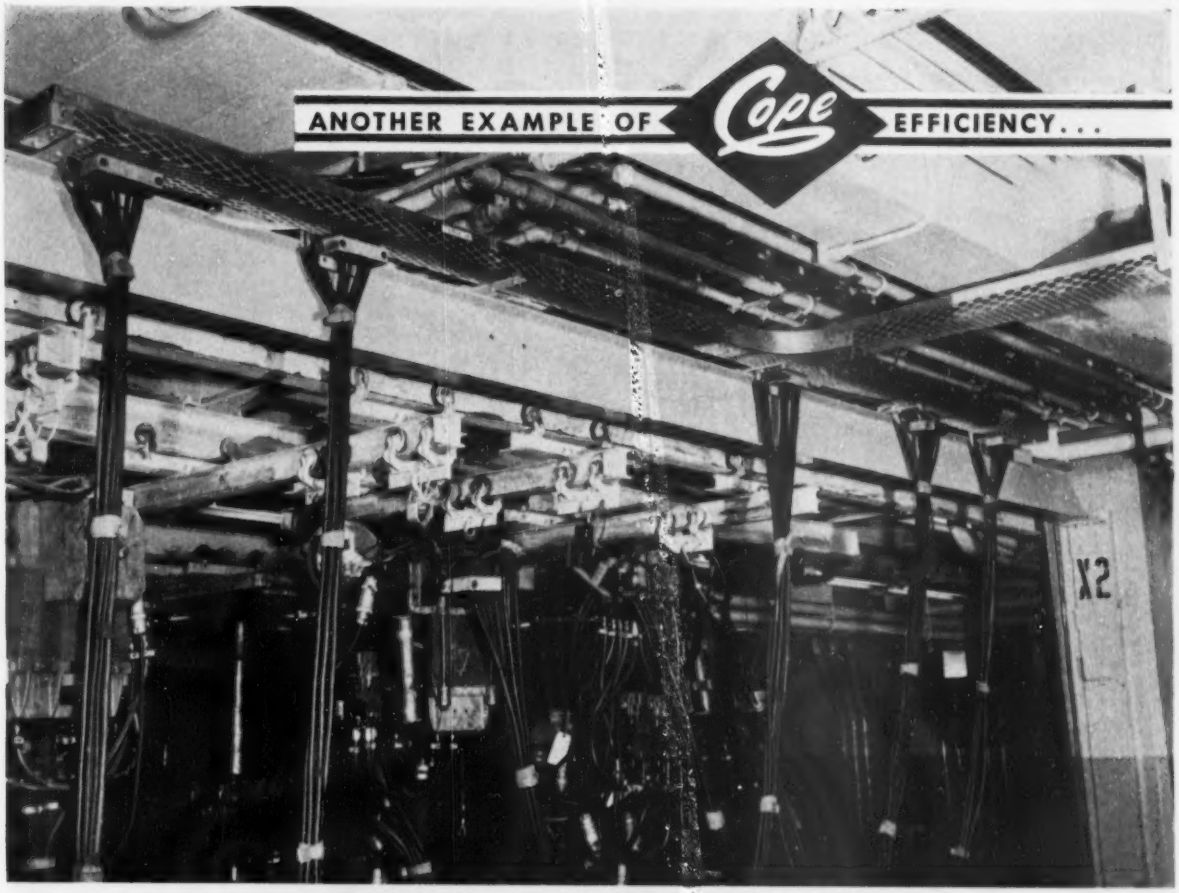
Hexagon head steel bolt with square shank gives linemen option of using wrench on bolt head for tightening.

WITHSTANDS TEMPERATURE FLUCTUATIONS
Spring action of the design and extra-heavy lockwasher insures a permanently tight connection that will withstand temperature fluctuations.

AVAILABLE THROUGH ELECTRICAL WHOLESALERS EVERYWHERE

The molten aluminum has a coefficient of expansion 38% greater than that of the copper. As it shrinks in solidifying, great clamping force is exerted against the copper establishing an air-proof, moisture-proof joint. Because operating temperatures never approach the heat of molten aluminum, this key-lock shrink-fit is permanently maintained.

JASPER BLACKBURN CORPORATION
35 Madison Street • St. Louis 6, Mo. • Phone MAin 1-2821



Cope Cable Trough installed at the Ford Motor Company, Dearborn, Mich.

COPE CABLE TROUGH—*VERSATILE, INDEED!*

The photograph above shows a run of Cope Cable Trough carrying not only power cables for the overhead electric welders, but tubing for the cooling water as well! It is an excellent example of the versatility of this method of power distribution.

The low cost and the ease with which Cope Cable Trough may be installed are making it extremely popular these days as a standard system for the support of power and control cables.

And that's not all . . . the trough is available in a wide range of sizes and fittings which permit it to be quickly set up at the job site to conform to almost any plant layout.

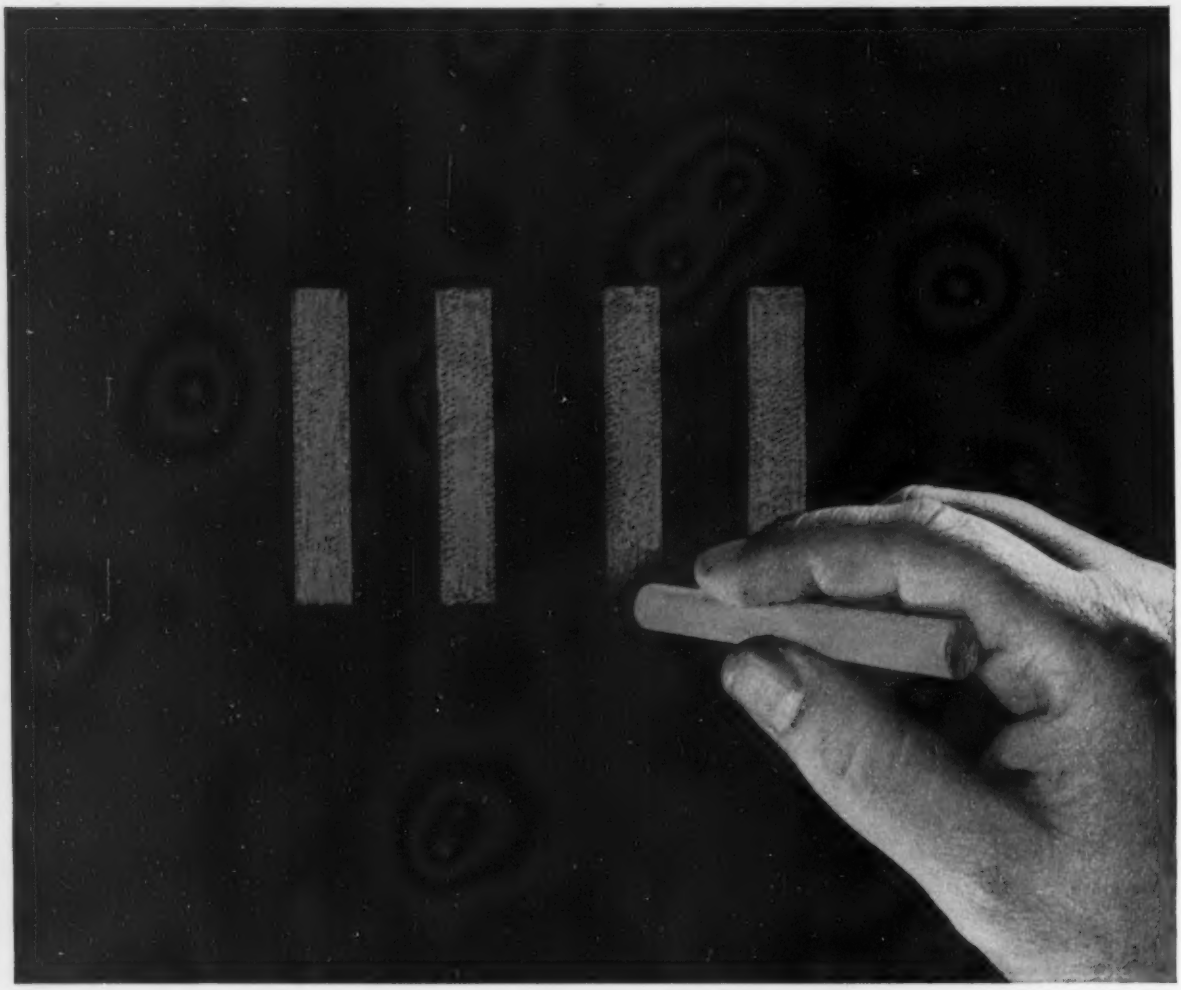
Why not find out more about Cope Cable Trough? Write today for further information . . . Ask for Bulletin 11-W.

You know Cope by these products

Cope

T. J. COPE, INC.

711 SOUTH 50th ST., PHILADELPHIA 43, PA.



THE ADVANTAGES OF

FLAT BAR

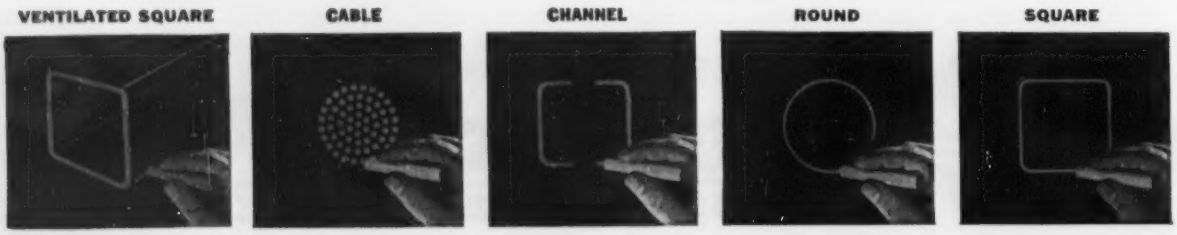
BUS CONDUCTORS

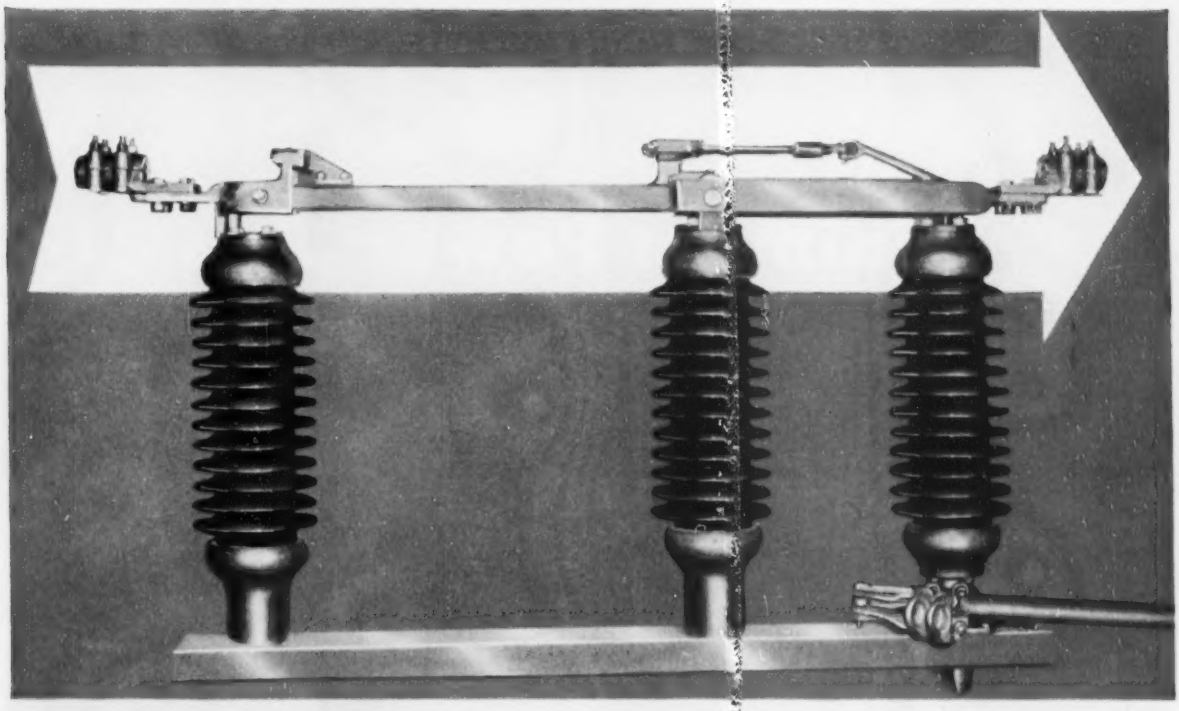
For heavy direct currents, the capacities of multi-bar busses are theoretically unlimited if adequate copper section and ventilation are provided. Flat bars require minimum space for making connections to apparatus without special joint preparation. They may also be bent flatwise or edgewise for making connections.

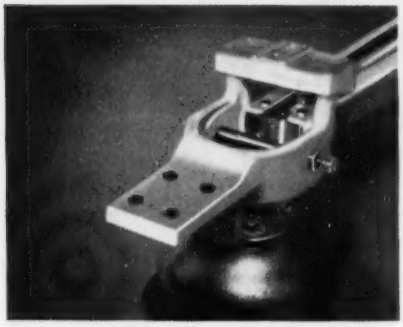
The 60-cycle a-c capacity of flat busses is limited to approximately 3000 amperes because of uneven current distribution. Laminated construction is used when space permits interlacing the phases to counteract "skin" and "proximity" effects.

There is a complete line of ANACONDA Copper Bus Conductor designs for every type of installation and power requirement. Write today for your copy of "ANACONDA Copper Bus Conductors" containing illustrations and detailed technical information. *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.* 53132 Rev.

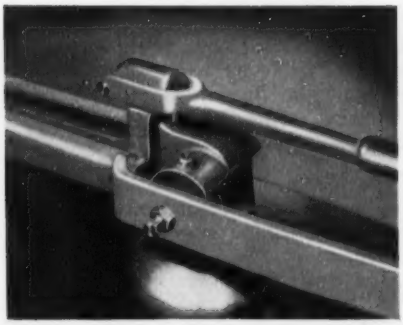
carry the load with ANACONDA® Bus Conductors







Front Contact



Hinge Contact

Straight line current path on 3E Airbreak Switch offers major advantages

Cuts down short circuit troubles. Engineers specifying outdoor airbreak switches in the 7.5 KV to 330 KV range will find this 3E design most attractive. Its straight line current path greatly increases ability to withstand "short time" currents.

Design eliminates most of wear on parts. Two important factors insure a long life with a minimum of maintenance . . . there are no braids used on the 8400, and the design of the high pressure contacts eliminates 90% of the friction and strain usually found in high pressure switches. The contacts achieve pressure under spring action. When the switch is closing, a limiting sleeve restrains spring pressure until the switch is approximately 10% from full closure. When the switch is open, this action is reversed. Thus, 90% of the pressure is held in check during opening and closing and there is correspondingly 90% less wear and strain on the silvered contacts and moving parts. With this work load lightened, the 8400 is remarkably easy to operate even when heavily iced.

For complete details write for Bulletin No. 327

3E 8400 AIRBREAK SWITCH

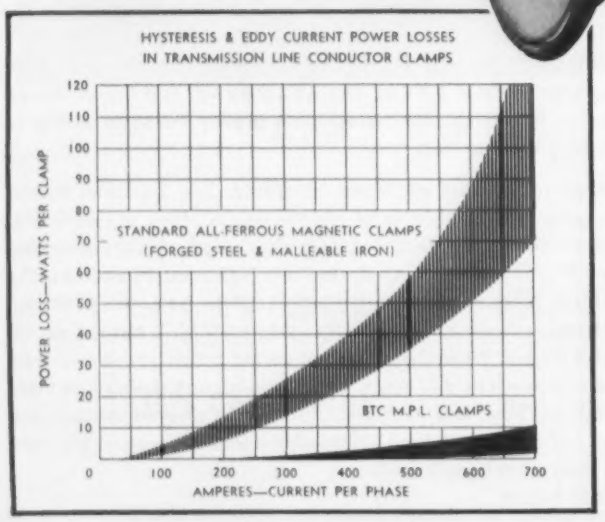
ELECTRICAL ENGINEERS EQUIPMENT CO., Melrose Park, Illinois

Minimum Power Loss

One of the basic advantages you get with

BTC

Drop Forged M.P.L. ALUMINUM Suspension Clamps



IT'S A FACT...

The use of a non-magnetic Aluminum Clamp Body reduces eddy current and hysteresis losses to a minimum. At the same time, it prevents temperature rise in clamped section of the conductor, which will operate at lower temperature than in the span.

THIS IS JUST ONE of many reasons why it pays to use BTC drop forged M.P.L. Aluminum Suspension Clamps on your transmission lines. Specify these performance-proved BTC Clamps the next time you order from your insulator manufacturer!

Sold Through Your Insulator Manufacturer Only.

Drop Forged BTC *Hi-Line Hardware*

The BREWER-TITCHENER Corporation

Cortland · New York

Poles and crossarms last years longer when protected against decay and insect attack with clean Monsanto Penta.

Penta-treated poles are easy to handle and will not "burn" the hands of workmen. Penta will not bleed or leach out of wood. The protection of this chemical against decay and insects lasts for many years.

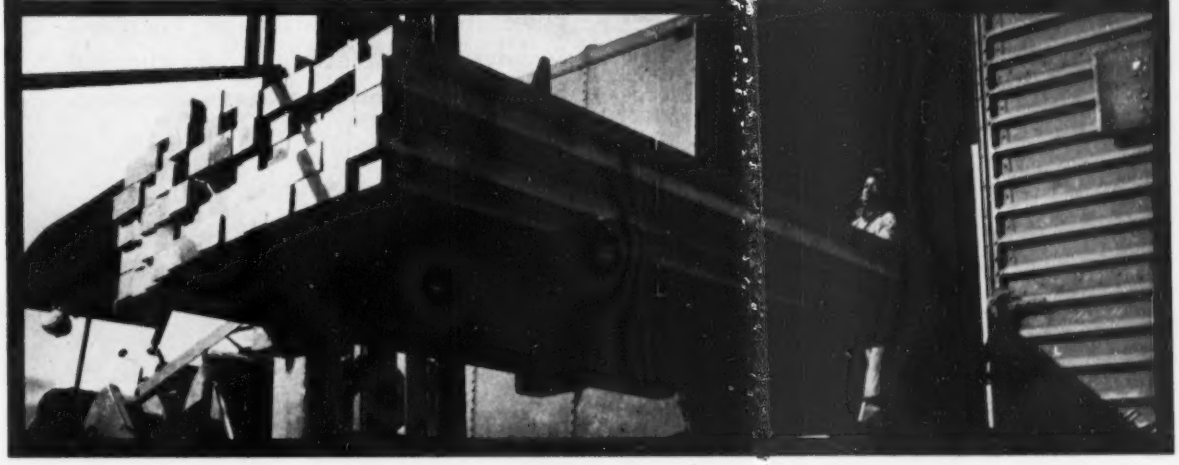
Penta cuts costs: Southwestern Electric Service Company recently specified penta-treated Southern Yellow Pine poles for the white-way lighting system in Jacksonville, Texas. For this special installation, poles were hand-picked for straightness, peeled, and coated with aluminum paint. Southwestern reports these wood poles were erected at *one-third the cost* of metal light standards.

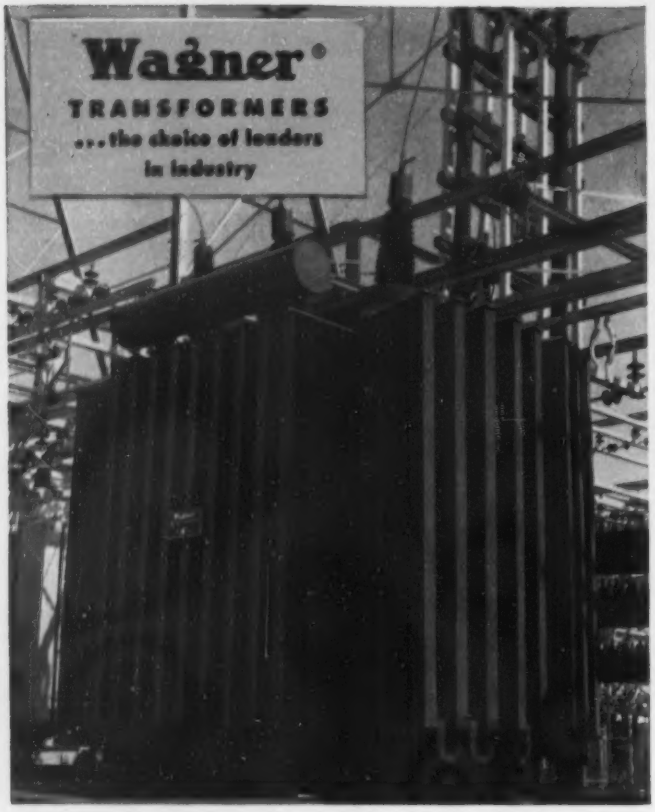
FOR A COPY of "Penta for Poles and Crossarms" write: Organic Chemicals Division, Monsanto Chemical Company, Box 478, St. Louis 1, Mo.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

PENTA-TREATED CROSSARMS (below), shown being shipped to a customer from one of the 75 treating plants that apply Penta, will outlast untreated members at least 4 to 1.





Wagner Transformers installed at Aluminum Company of America Rockdale, Texas smelting plant

A bank of four Wagner Power Transformers has recently been installed in the main substation at the Rockdale, Texas smelting plant of the Aluminum Company of America.

Each transformer is rated 25000/33333/41667 kva, 138,000 to 13,800 volts.

Wagner Transformers were chosen for this installation, as they are for many power companies and industrial plants, because of their ability to give reliable and economical service over unusually long periods of time.

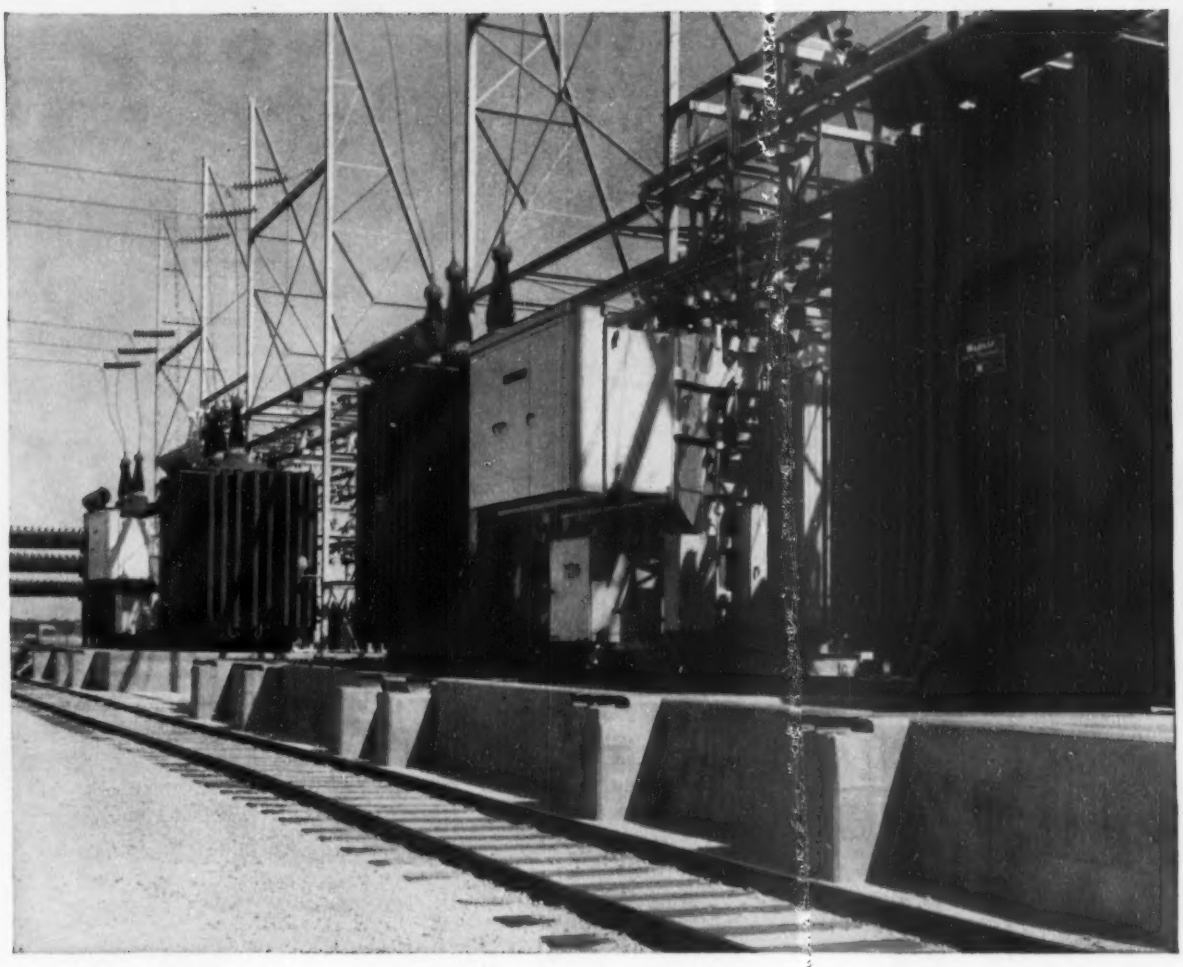
Wagner Power Transformers have been serving the power industry since 1891. Service records from the field, dating back more than sixty years, prove that thousands upon thousands of Wagner Transformers are giving thoroughly dependable service.

Why not look to Wagner for your next power transformer installation? There is a Wagner field engineer near you who will be glad to offer his services as a consultant.

* * *

If you need power transformers rated 10,000 kva and below—three phase, or 5,000 kva and below—single phase, why not check ASA C57.12b Standards and use them as your specifications? In addition to saving the cost of preparing specifications, you will also realize a substantial saving in price by using Wagner Standard Transformers.

T54-13



Wagner has all the manufacturing facilities and years of engineering "know-how" necessary to build power transformers in the ratings required for modern power systems. Branch offices are maintained in 32 principal cities, for quick, convenient engineering service and consultation.

Bulletins TU-180 and TU-181 give full information on Wagner Power and Distribution Transformers. Write for your copies today.

Wagner Electric Corporation
EST. 1891

WAGNER ELECTRIC CORPORATION
6456 Plymouth Ave. • St. Louis 14, Mo., U. S. A.

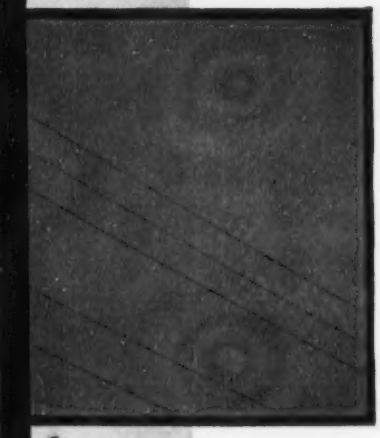
ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS — AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

C-D
best by
FIELD

It takes a hotfoot with a grin, and comes right back for more. Yes, there are C-D capacitor installations that have been standing out in the blazing desert sun, day in and day out for over 10 years—*with little or no maintenance required.* This severe service requirement is one of the reasons why C-D builds them bigger—for better dissipation of heat. That is why too, C-D capacitors have the lowest volt-ampere per square inch of radiating surface.

TEST



Still another reason why C-D's have this unusual trouble-free performance record, even under desert conditions, is their superior design that calls for the highest major insulation level and the lowest dielectric unit stress. Insure low-maintenance service from your next power-factor installation, by talking it over first with a C-D engineer.
Cornell-Dubilier Electric Corporation,
Dept. D-114, South Plainfield, New Jersey.

ONSISTENTLY EPENDABLE

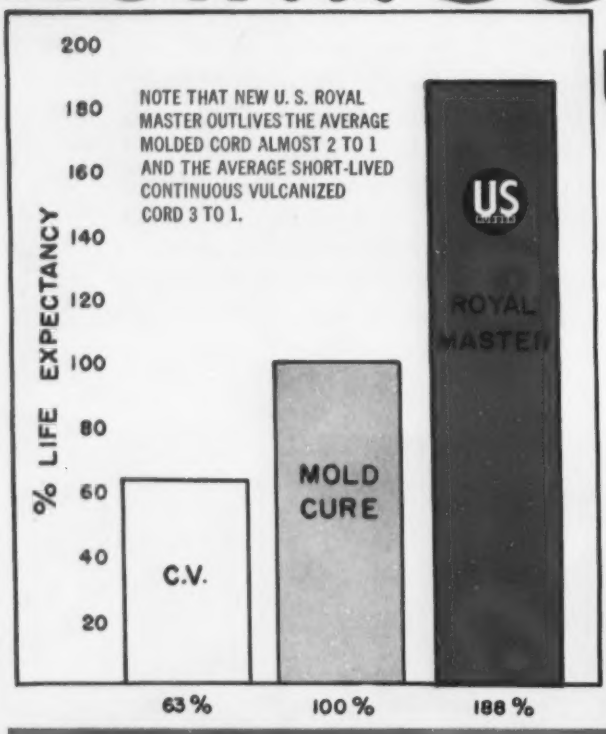
CORNELL-DUBILIER CAPACITORS

FOR POWER-FACTOR IMPROVEMENT

PLANTS IN SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS.; PROVIDENCE AND HOPE VALLEY, R. I.; INDIANAPOLIS, IND.; SANFORD AND FUQUAY SPRINGS, N. C.; SUBSIDIARY: THE RADIART CORPORATION, CLEVELAND, O.

THERE ARE MORE C-D CAPACITORS IN USE TODAY THAN ANY OTHER MAKE

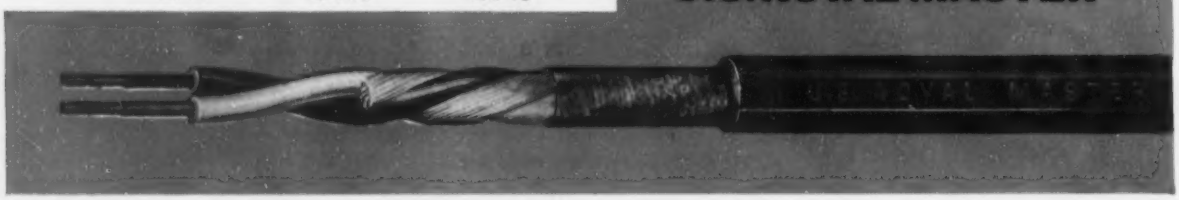
Now...88% longer U.S. ROYAL



Chart—summarizing individual service factors weighted by their contribution to overall service life—shows new U. S. Royal Master Cord gives 88% longer life than the average of competitive molded cords.

LOOK FOR THE NAME—

U.S. ROYAL MASTER



Superior on every count!*

- 33.3% greater heat resistance
- 55.7% greater impact strength
- 53.8% greater abrasion resistance
- 30.6% greater resistance to cutting
- 110.3% greater resistance to tearing
- 21.2% greater tension or breaking strength
- 23.3% greater oil resistance
- 128.8% greater flexibility

*to the average of molded cords of other makes

US RUBBER

UNITED STATES

ELECTRICAL WIRE AND CABLE DEPARTMENT

cord life—with NEW MASTER portable cord!

Far outlasts *any* other cord made!

Service to cost ratings show new U. S. Royal Master Cord actually gives $1.88 in value for every cord dollar when compared to the average competitive molded cord!

Two years ago, "U. S." engineers began a *complete reexamination* of portable cord construction, service life, and the causes of cord failure.

Over 10,000 tests were made. More than a thousand cords of all leading makes, including our own famous U. S. Royal Cord, were analyzed, tested, and compared.

Every life factor was considered and carefully evaluated, alone and in its relation to overall cord performance and service life.

Backed by 64 years of experience in the manufacture of electrical wire and cable, U. S. Rubber engineers then translated their findings into an entirely new portable cord, designed to surpass any other previously made.

Extensive tests, both in the laboratory and in outside plant installations have proved this new portable cord startlingly superior in every respect!

New U. S. Royal Master is unquestionably the finest cord you can buy!

From every standpoint, new U. S. Royal Master is a finer, more durable cord—actually gives 88% longer life than the average of other molded cords—far longer than *any* other cord—surpassing even a *hypothetical* cord incorporating the best features of all those tested!

Far greater value, too! In spite of almost doubled service life, this great new cord is in the same price category as other molded cords—giving you $1.88 in cord value for every cord $1.00!

Prove to yourself the outstanding superiority of new U. S. Royal Master Portable Cord—in both service life *and* economy! Get in touch with your "U. S." distributor today!

Approved by Underwriters' Laboratories, Inc.

RUBBER COMPANY

ROCKEFELLER CENTER, NEW YORK 20, N. Y.

RM POWER TRANSFORMERS

the benefits of ASA standards

RM* brings you all these benefits

Repetitive Manufacture gives you the economy of a standardized product, yet with optional ratings and accessories sufficient to meet most special needs. Ordering is simpler, shipment is many weeks faster, and prices are up to 8% less than those of nonstandard units.

**RM is the G-E designation for ASA-standardized power transformers 69 kv and below; 501 through 5000 kva single-phase, and 10,000 kva three-phase.*

LOWER PRICE

plus . . . . . Superior rust prevention

because Super Melaglyp paint finish lasts up to 150% longer

When you need a transformer in the medium range, order a G-E Repetitive-Manufacture transformer, and you'll get all the benefits of ASA Standards, plus exclusive features that give you better performance, easier handling and less maintenance.

SUPERIOR RUST PREVENTION, for example, is obtained with Super Melaglyp—General Electric's new outdoor paint finish. Lasting up to 150% longer than previous finishes, Super Melaglyp is applied to all transformers manufactured at G.E.'s new Medium Transformer Plant.

Completed tanks are first cleaned by blasting to remove scale and to prepare the surface for the application of the three-coat paint system. After leak testing, the tanks are given a primer coat pigmented with rust inhibitors to prevent corrosion and two finishing coats of Super Melaglyp. Each coat is thoroughly baked on at 150 C before the next one is applied.

The result is the smoothest, most durable outdoor paint finish obtainable today. It protects equipment better and lasts longer — saving repaintings. Super Melaglyp averages 50% longer life. In salt and chemical atmospheres it has an increased resistance of 75% or more over the previous finish.

MANY OTHER BENEFITS result from the advanced methods and processes used in General Electric's new plant at Rome, Ga. These include high dielectric strength because vapor-phase drying removes entrapped moisture, stronger liquid-tight tanks because submerged-arc welding strengthens major tank joints, and quicker delivery from faster, conveyorized production. Built solely to produce power transformers in the medium range, this plant serves electric utilities and industry by turning out better transformers in shorter time. You can get full information about RM power transformers by contacting your nearest G-E Apparatus Sales Office, or by writing for Bulletin GEA-6108 to General Electric Co., Section 422-12, Schenectady 5, N. Y.

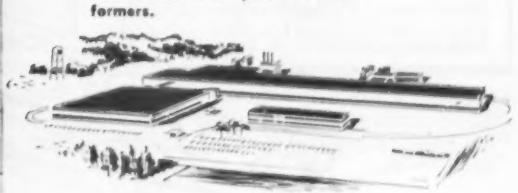
Progress Is Our Most Important Product

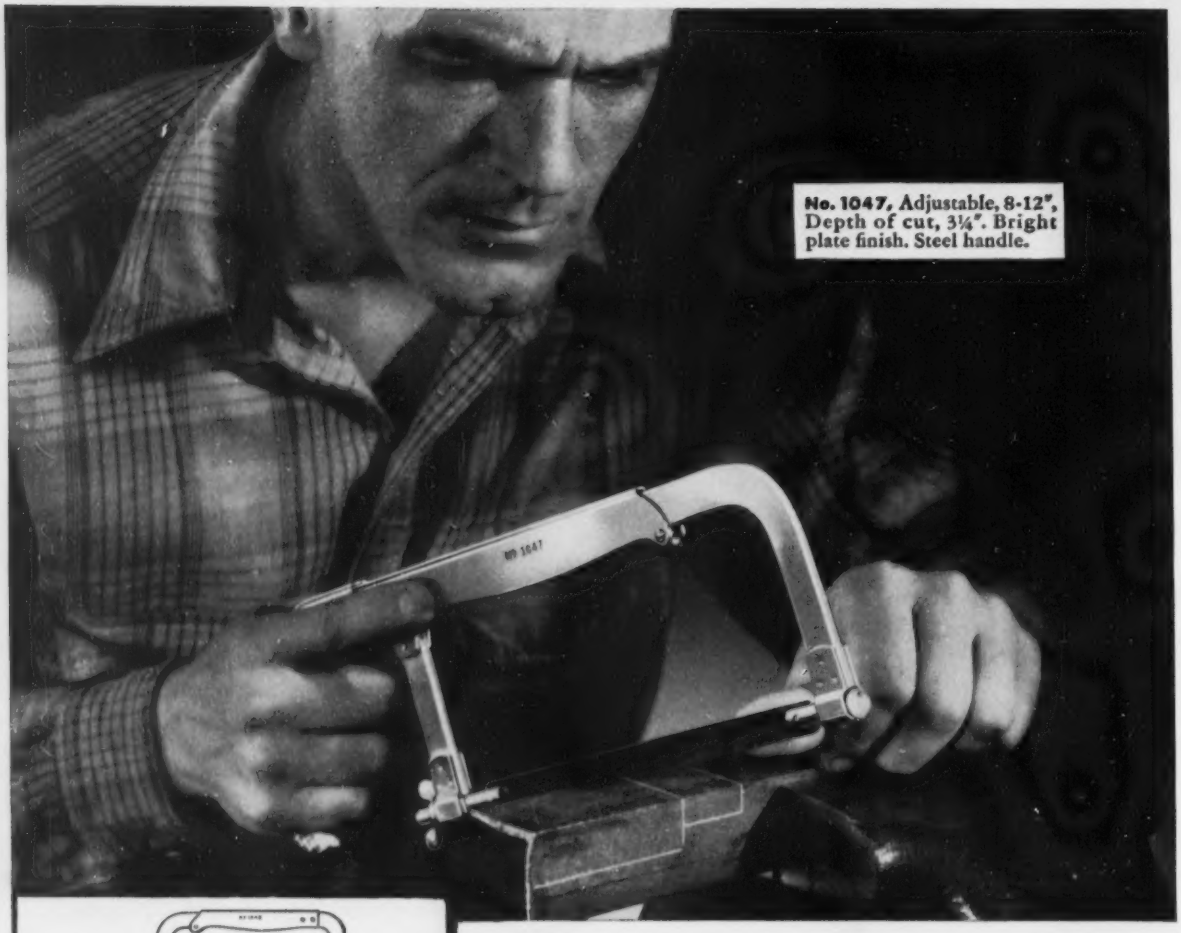
GENERAL ELECTRIC

SIMPLIFIED PURCHASING

SHORTER SHIPMENT

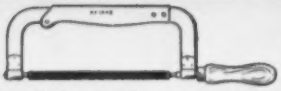
G.E.'s NEW, ROME, GA. TRANSFORMER PLANT—built specifically to meet the growing trend to standardized power transformers.



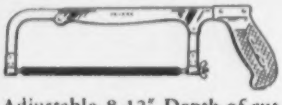


No. 1047, Adjustable, 8-12″, Depth of cut, 3¼″. Bright plate finish. Steel handle.

No. 1042



Adjustable, 8-12″. Depth of cut, 2½″. Bright plate finish. Wood handle.

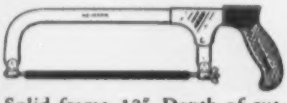


No. 1046

Adjustable, 8-12″. Depth of cut, 2½″. Bright plate finish. Steel handle.

No. 1049

Adjustable, 8-12″. Depth of cut, 3¼″. Bright plate finish. Neoprene handle.



No. 1044N

Solid frame, 12″. Depth of cut, 3¼″. Bright plate finish. Neoprene handle. Also No. 1044 with steel handle.

CRESCENT HACKSAWS

● Strong, rigid, well-balanced Crescent Hacksaws are designed for the exacting mechanic. Choose from five popular patterns having wood, steel or Neoprene handles. The Neoprene handles are far superior to plastic. They are impervious to oil and acid, unaffected by extremes of heat or cold, have high dielectric value and are practically unbreakable. Sold by Industrial Distributors and Hardware Dealers everywhere.

CRESCENT TOOLS
Give Wings to Work
®
Sign of the Artisan
Symbol of Excellence

Crescent is our trade-mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

This single-phase power regulator has

5 ratings... 5 ranges of regulation

25 possible combinations!

CHANGE RATINGS IN SECONDS. *Vari-Amp* indicator saves time, makes more flexible regulation possible at low cost. To change rating, just open the window and place stop screws in proper place. No electrical connections to make—no need to remove regulator from service when making this adjustment.

Provides Flexibility For System Growth

HERE'S HOW IT WORKS: The *Vari-Amp* feature provides *five* intermediate steps for increasing current capacity instead of the two provided on all other regulators. You can meet regulation requirements at less expense in most cases. And when loads grow, changes are easier, costs less because ranges of regulation need to be reduced only proportionately instead of sliced in half as with other regulators. Extra short-circuit capacity is available. No other regulator offers flexibility like this.

The *Vari-Amp* feature permits increasing ratings to 114%, 133%, 160% and 200% with corresponding reduction in percentage of regulation. This reduction is proportionate to the rating increase, and is in five gradations from the original range of 20% to 10%.

Permits Unequal Range of Regulation

The *Vari-Amp* feature permits unequal range of regulation. You can retain full 10% lower if current is low. Then the regulator operates less than 10% in the raise direction at heavier loads, and at full 10% in the lower direction at lighter loads.

In addition to multiple ratings, on Allis-Chalmers single-phase power regulators you get low exciting current, low maintenance, *Quick-Break* tap-changing mechanism, and close, accurate control. Get more facts on the next page.

A-4458

ALLIS-CHALMERS

Originators of 5/8% Step Regulation

For high profit, low maintenance

Vari-Amp feature brings you these extra ratings

Volts	Kva of Regulator	±10%	±8⅓%	±7½%	±6¼%	±5%
2400	12	50 amp	57 amp	66.5 amp	80 amp	100 amp
	24	100	114	133	160	200
	36	150	171	200	240	300
	48	200	229	267	320	400
	60	250	286	334	400	
	72	300	343	400		
	96	400				
4800	12	25	28.6	33.3	40	50
	24	50	57	66.5	80	100
	36	75	85.7	100	120	150
	48	100	114	133	160	200
	60	125	143	167	200	250
	72	150	171	200	240	300
	96	200	229	267	320	400
	120	250	286	334	400	
	167	348	397			
6900	17.3	25	28.6	33.3	40	50
	34.5	50	57	66.5	80	100
	69	100	114	133	160	200

Extra Short-Circuit Capacity Available

25 times normal short-circuit capacity available with each of these current ratings gives short-circuit capacities as high as 10,000 amperes on smaller units.

Low excitation current means lower installed cost

A major cost savings is possible using Allis-Chalmers single-phase power regulators. It's because of the savings on capacitors normally needed to offset excitation current in the regulator. Allis-Chalmers step-type single-phase power regulators require only ⅓ the excitation of other types of regulators.

No other standard single-phase power regulator can offer this type of saving. In addition, low exciting current releases system capacity for useful loads.

The difference in exciting current is in the fact that a step regulator has exciting current requirements like a transformer, rather than like an induction motor as do other types of regulators.

An example of savings in initial cost is shown in a 72-kva, 2400-volt regulator. Exciting current of a step regulator of this rating is 6.72 kva compared with the exciting current of the other type regulator, which is 20.16 kva. Adding capacitors to counteract the effect of the extra kilovars adds a total of 3.6% to the cost of the installation. On many systems this extra cost could run into thousands of dollars. For more information, write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 01B6065C, or call your nearby A-C office.

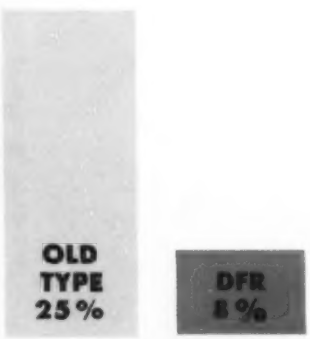


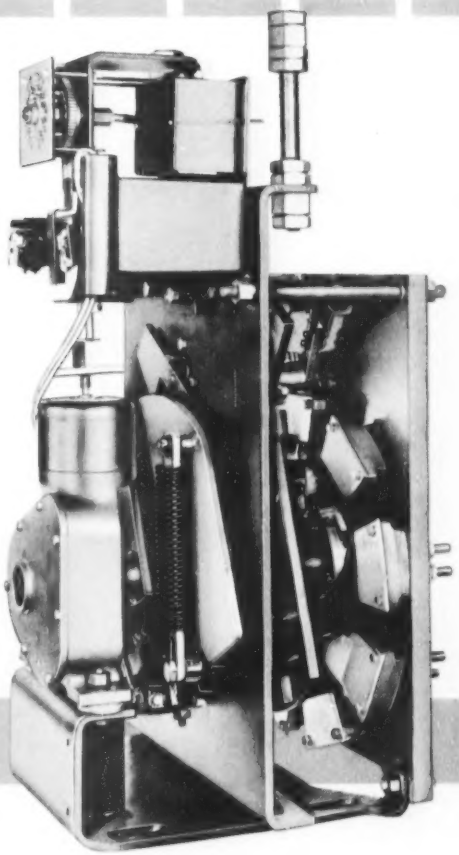
Chart shows difference in excitation requirements, comparing the other type single-phase power regulator with an Allis-Chalmers single-phase regulator.

Regulation!

Famous *Quick-Break* mechanism provides proved reliability, low maintenance

All Allis-Chalmers step regulators use the rugged *Quick-Break* tap-changing mechanism. For more than 20 years this mechanism has proved the simplest, most reliable means of changing taps under load. Original laboratory tests proved it could withstand 100 years of operation. Field installations over the past two decades have borne out these tests.

All moving parts are immersed in oil, including tap changer, motor and mechanism. The motor has neither commutator, slip rings, brushes, nor centrifugal switch. Contacts are large and rugged — manufactured of special arc-resisting alloys. The entire mechanism needs no sealing-in switches or brakes — completely eliminates a major source of maintenance.



ALLIS-CHALMERS
5/8% STEP VOLTAGE REGULATORS

CONTROL EQUIPMENT is mounted in an easily accessible cabinet. Control panel is pivoted, swings out to facilitate inspection.

Feather-Touch control for close, accurate regulation

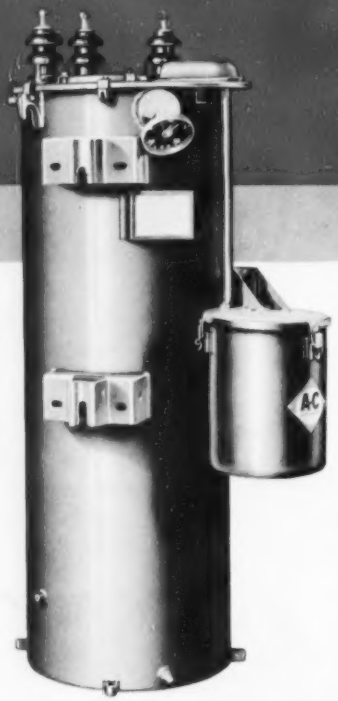
Automatic *Feather-Touch* control gives Allis-Chalmers single-phase power regulators Class I accuracy and a total band of only ± ¾ volt. Holding coils or holding-in magnets are completely eliminated. A dual cantilever suspension permits practically frictionless operation. Aging of springs cannot affect control operation.

Controls are mounted in a single chassis enclosed in a weather-tight cabinet on the front of the regulator where they are easily accessible. The voltage integrator permits the narrow band width setting without excessive operations. Large finger-fit control knobs simplify settings.

ALLIS-CHALMERS

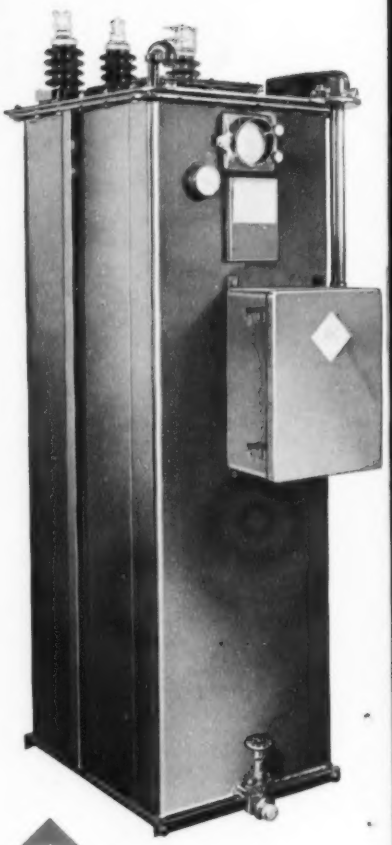
Originators of 5/8% Step Regulation

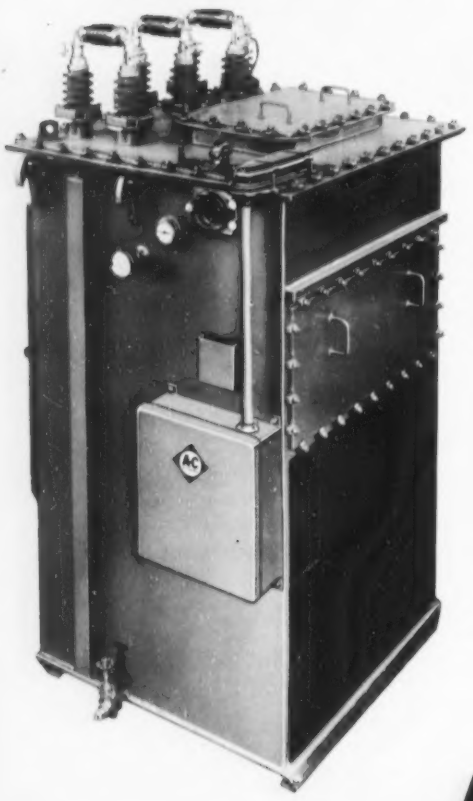
For Every Regulation Need



ALLIS-CHALMERS

5/8% STEP VOLTAGE REGULATORS





POWER REGULATORS are available in three-phase ratings through 69 kv, in sizes to 2500 kva. Single-phase units equipped with the *Vari-Amp* feature are available in standard sizes. Allis-Chalmers power regulators have been applied on more than 5 million kva in utilities throughout the country.

DISTRIBUTION REGULATORS bring all the advantages of Allis-Chalmers 5/8% step voltage regulators in ratings from 2500 to 14,400 volts, 15 to 200 amp. For complete information, see your nearby A-C office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

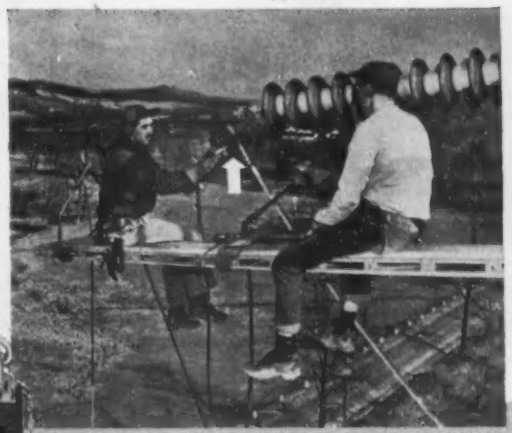
Milwaukee 1, Wisconsin

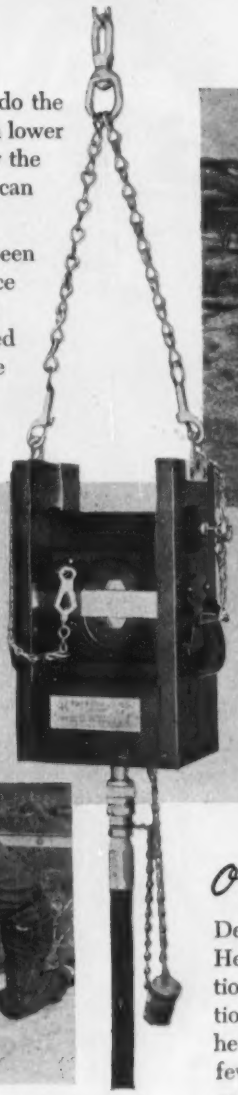
Now *ONE* portable tool makes transmission line splices

OVERHEAD

It's no longer necessary for linemen to do the sagging and marking overhead and then lower the line to the ground for splicing. Now the complete operation, including splicing, can be performed overhead.

T&B's Forty-Ton Hydraulic Head has been specially designed for heavy-duty service in building transmission lines. Since it weighs only 36 pounds, this factory-rigged tool can be put into operation anywhere a man can throw a rope. Safety chains keep all removable parts from falling to the ground.





T&B's Forty-Ton Hydraulic Head, Cat. No. 21940, specially designed for transmission line building.

or ON THE GROUND

Demountable legs hold T&B's Forty-Ton Hydraulic Head at convenient working height when installations are being made on the ground. During operation, hardened steel dies compress fitting and cable hexagonally into one homogeneous mass . . . all in a few seconds. The same die set installs tension splicers, dead ends, loop splicers and taps, tees and terminals.

Modern hydraulic design has virtually eliminated the need for maintenance. However, field maintenance is simple and practical. The 21940 Installing Head can be completely disassembled and reassembled in less than one-half hour with these common tools: screw driver, Allen wrench, and mallet.

T&B Bulletin 70 gives a detailed description of the Forty-Ton Hydraulic Head as well as complete lines of T&B connectors, tools, and accessories for transmission line building. Send for FREE copy.

LOOK FOR THIS SIGN —

AUTHORIZED DISTRIBUTOR T&B ENGINEERED

IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs. T-418

THE THOMAS & BETTS CO.

INCORPORATED

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Thomas & Betts Ltd., Montreal, P.Q., Canada
MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898

7.5 KV to 69 KV
400-600-1200 AMPERES
GROUP OPERATED

"Neither snow, nor rain, nor heat . . ."

Like the American Postman—Roller-Smith equipment for the Electrical Industry serves dependably under extreme conditions.

This new Duo-Roll Air Break Disconnect Switch typifies quality of the equipment manufactured by Roller-Smith for the Electrical Industry. Our Products incorporate all the very latest design improvements and offer all the advantages that modern production techniques and strict testing procedures provide. Shown operating under a 1½ inch ice load, this new switch includes the following features which assure the same trouble-free performance you can expect from all Roller-Smith equipment.

- HIGH PRESSURE, SELF-CLEANING SILVER CONTACTS.
- COMPLETELY VISIBLE HINGE AND CLIP CONTACTS.
- "SHUNT-LESS" HINGE CONTACT ALWAYS ENGAGED.
- BUILT TO WITHSTAND HIGH SHORT-CIRCUIT CURRENTS.
- RE-DESIGNED SWITCH BLADE ROTATES TO CRACK ICE LOAD, THEN RAISES TO OPEN CIRCUIT.
- SWITCH BLADE IS "LOCKED" WHEN IN CLOSED POSITION.
- SWITCH MAY BE MOUNTED IN ANY POSITION.
- ADJUSTABLE CLEVIS ASSURES POSITIVE CONTACT AT ALL MOVING PARTS.
- HINGE AND CLIP TERMINAL PADS ARE AT SAME ELEVATION.
- ROTATING INSULATOR BEARINGS ARE SELF-LUBRICATING.

Roller-Smith
CORPORATION
ELECTRICAL SWITCHGEAR
BETHLEHEM, PENNSYLVANIA

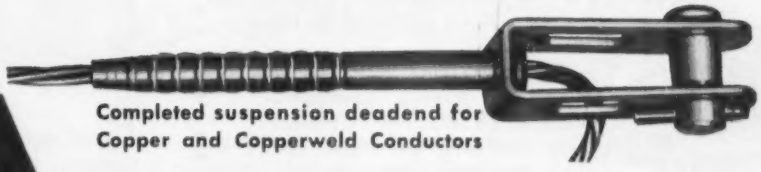
Available thru Authorized Wholesalers.
Sales Representatives in all principal Cities.
CANADIAN FOREIGN

"JOB PROVEN" THE WORLD OVER Nicopress

Nicopress 53-XPJ
3-Groove Tool
with X, P, & J grooves

Completed splice on Solid Copper Conductor

Completed splice on Copperweld Conductor



Completed suspension deadend for
Copper and Copperweld Conductors

Partially completed reinforcing sleeve on Copperweld

Nicopress sleeves and tools are available in a complete range of sizes for Copper, Copperweld, All-Aluminum, and A. C. S. R. Conductors.

Nicopress Sleeves and Tools Patented in U. S. and Foreign Countries. "Nicopress" Registered in U. S. and Foreign Countries.

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.—N. SLATER CO., LTD., HAMILTON, ONT., CANADA

Export Distributor—INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

AMCRECO
LOWRY PROCESS
CREOSOTED WOOD
1904·1954

50th

MARKS FIRST HALF CENTURY OF MADE POSSIBLE BY THE INVENTION C. B. LOWRY, FOUNDER OF THE

THE durability of wood was a problem even in earliest times. The first country, however, to realize that wood preservation was a matter of national importance was England during the 18th century when her forests were being depleted to build and maintain a vast merchant fleet and navy. The problem became increasingly severe during the 19th century in England and in Europe with the growth of the railroad systems.

The threatening timber famine touched off feverish experimentation to find a suitable wood preservative, but none was found until about 1838, when John Bethell patented his process in England. At about this same time, preservatives other than creosote (dead oil of coal tar) were introduced, but the Bethell creosoting process proved to be the most reliable and, to a great extent, replaced all other processes abroad.

By 1880, it was becoming evident that the vast forests of the United States were being depleted at a high rate and that the time for action to prevent complete exhaustion was approaching. In this year, the American Society of Civil Engineers appointed a committee to study the problem. After several years of study, the committee reported that the Bethell Creosoting Process was the most effective method of wood preservation, but the cost was prohibitive due to the high price and scarcity of creosote in the United States, and the excessive amounts required to do a suitable job.

It was not until about 1904, after the development of the Lowry Process and the founding of the American Creosoting Company, that modern wood preservation was born.

FIFTY YEARS AGO, in a plant at Shirley, Indiana, the Columbia Creosoting Company started wood preserving operations for the Big Four Railroad Company (New York Central System) with a revolutionary technique called the Lowry Process. The rest is history. The Columbia Creosoting Company went on to become the American Creosoting Company of today, and its birth marked the beginning of the modern era of wood preservation.

The Lowry Process opened the door to the modern era by making it possible to impregnate wood successfully with far less creosote and in far less time than was required with Bethell's method. The Lowry Process cut the cost of creosoting practically in half.

Mr. C. B. Lowry, a founder of the American Creosoting Company, conceived the idea for his process about 1902, demonstrated it in an experimental plant for the Big Four Railroad at Riverside, Ohio in 1903, used it in commercial operations for the Big Four at the Shirley plant in 1904, and applied for a patent in 1905.

A method of treatment later known as the Ruping Process was introduced in Germany. Although there were important basic differences, the Ruping method was similar to the Lowry process insofar as it reduced the quantity of creosote used. Afterward, the German inventor of the Ruping Process filed an infringement suit against Lowry.

Anniversary

MODERN WOOD PRESERVATION OF THE LOWRY PROCESS BY AMERICAN CREOSOTING COMPANY

That Mr. Lowry and his company were the founders of modern wood preservation is amply proved by the decisions in these suits rendered by the United States Courts and the United States Patent Office.

An extract from these decisions is as follows:

"The Examiner of Interferences found that Lowry conceived the invention long prior to Ruping's introduction of it into this country, and that he did not derive his knowledge of it from Ruping's agents. That he successfully reduced it to practice with an experimental apparatus in the shops of the "Big Four" Railroad Company, at Riverside, Ohio, in November, 1903. That he communicated it to others, and in the spring of 1904 began efforts to build a plant at Shirley, Ind. for the operation of the process, which was prosecuted with diligence, and the process put into commercial operation on the completion of the plant.

"The Examiner-in-Chief concurred with the Examiner of Interferences in all respects save the reduction to practice at Riverside in 1903. On account of Lowry's earlier and independent conception, and subsequent diligence they concurred in awarding the priority to him.

"The Commissioner agreed in all respects with the Examiner of Interferences. We agree also that the evidence is sufficient to show that Lowry, prior to the experiments with the Ruping Process at Perth Amboy in April, 1904, had begun plans for the erection of the Shirley plant, which were diligently followed by completion and the practice of the process on a large scale."

Ruping filed an appeal in the United States Court of Appeals of the District of Columbia. The court upheld the decision of the U. S. Patent Office. Then Ruping filed an appeal in the U. S. Supreme Court, but a hearing was refused on the grounds that the case had been adequately handled by the lower tribunals. These years of litigation established, once and for all, that Lowry was the founder of modern wood preservation.

In this Golden Anniversary year, it is with great satisfaction that Amcreco looks back over a long record of service to industry and to our country in helping conserve the valuable timber resources of the land. Amcreco is also proud of its important contribution to modern forestry in the development of its great Satilla Forest in Georgia. But not content to rest on this record, Amcreco is looking forward to serving both industry and country with the same vision and vigor and high standards which have characterized the Company's policy for the past fifty years.

In an industry where so much depends on service, Amcreco offers facilities second to none. Our plants and sales offices are strategically located for prompt domestic or export shipment. We would appreciate an opportunity to quote on your needs.

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Shreveport Creosoting Company
Colonial Creosoting Company
Federal Creosoting Company
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AMCREco
LOWRY PROCESS
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Ratio range—3⅝ to 8¾.

Efficiency—up to 95% depending on ratio.

Application—Best economy in range up to 25 HP. Quiet operation, suitable for input speeds up to 2000 rpm.

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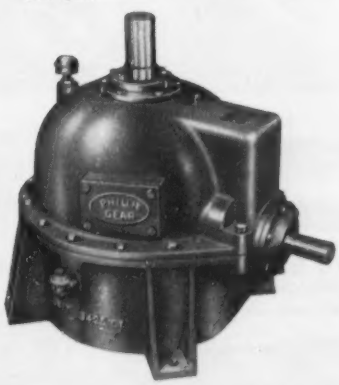
Efficiency—97-98%.

Application—Best economy above 15 HP. Advantages of high efficiency, small heat loss. Suitable for input speeds up to 2500 rpm.



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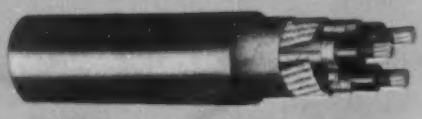

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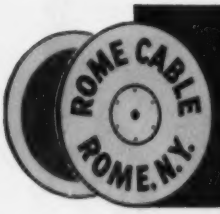

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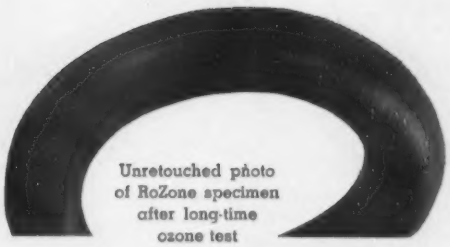
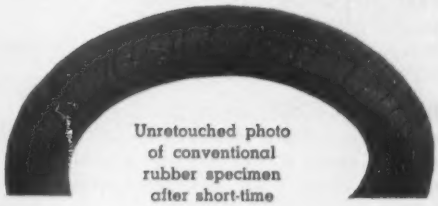


Unretouched photo of RoZone specimen after long-time ozone test



Unretouched photo of conventional rubber specimen after short-time ozone test

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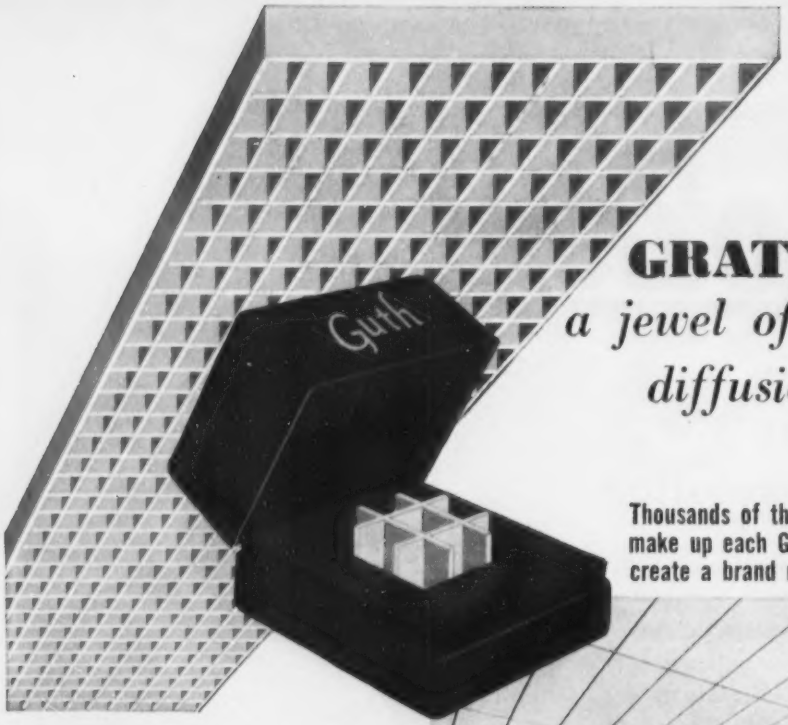

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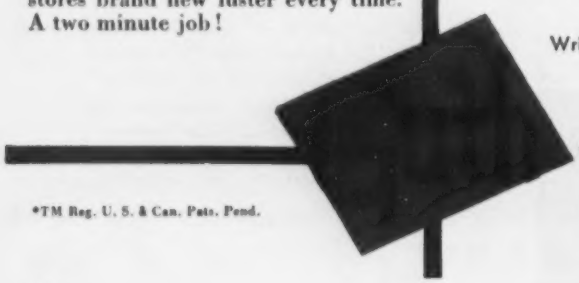

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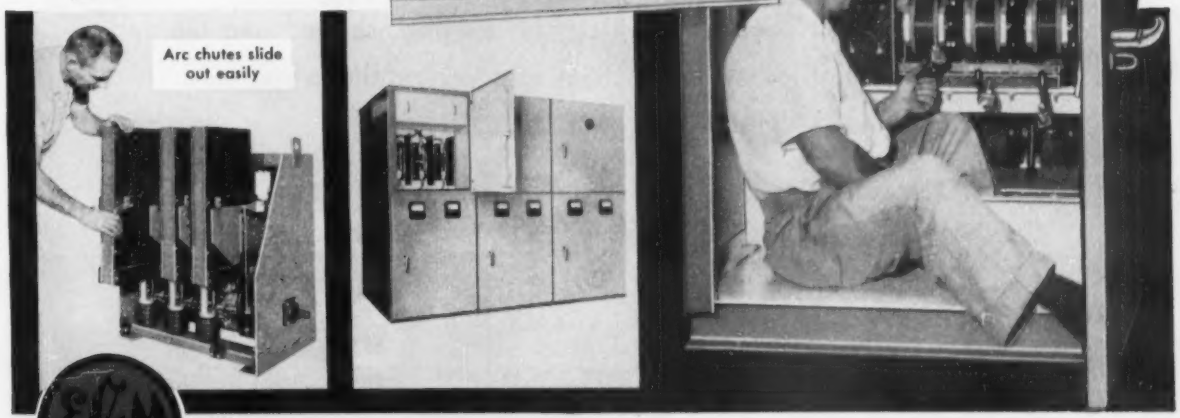

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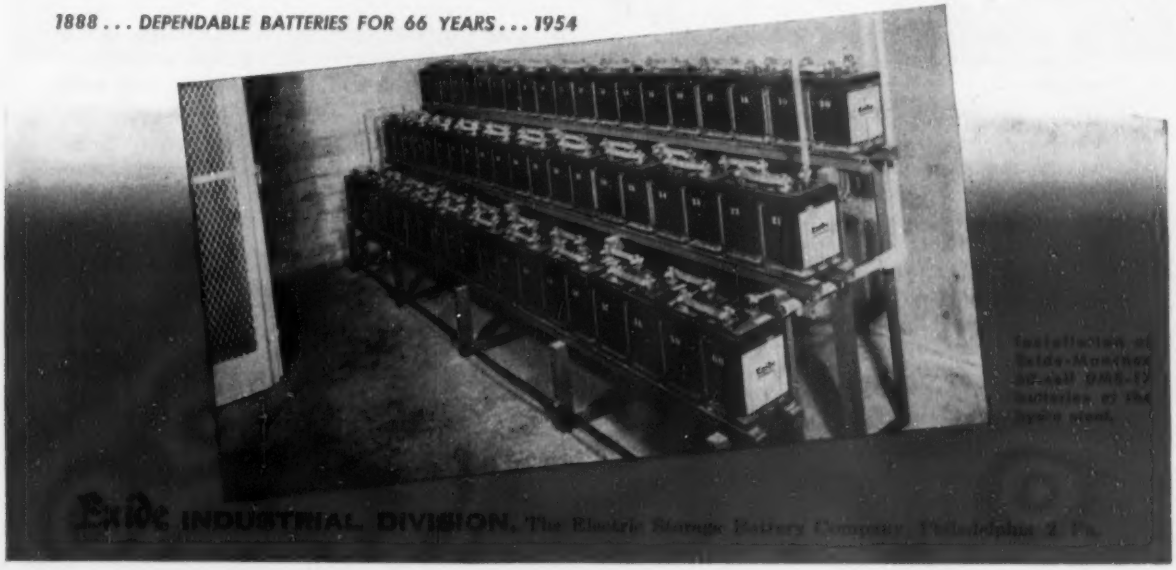

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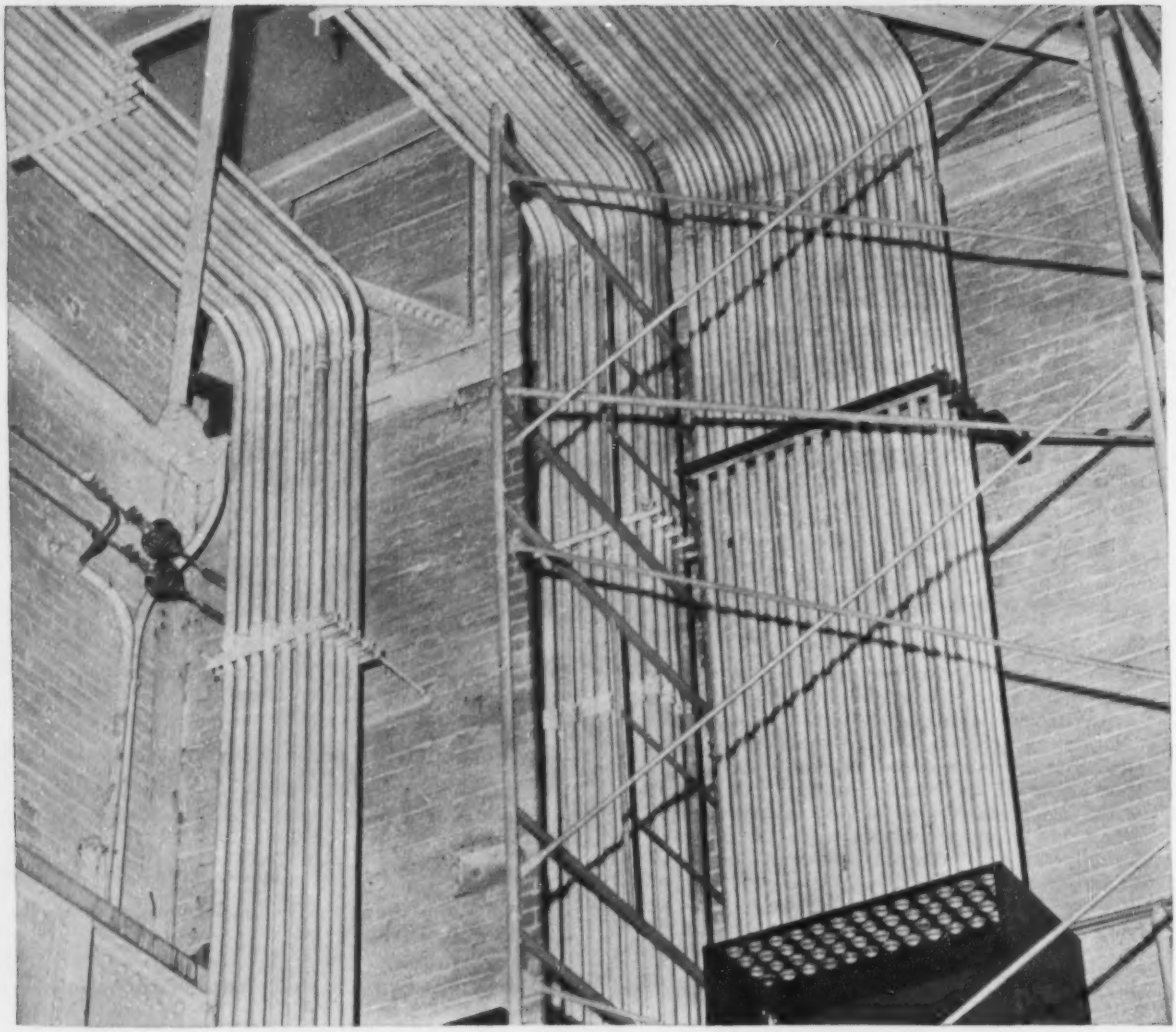

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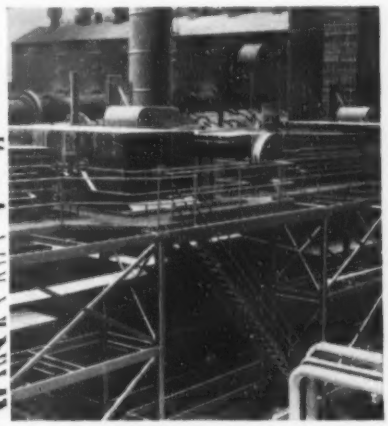

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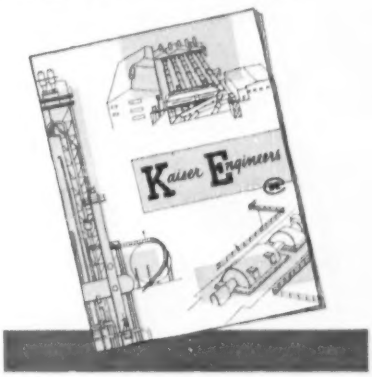

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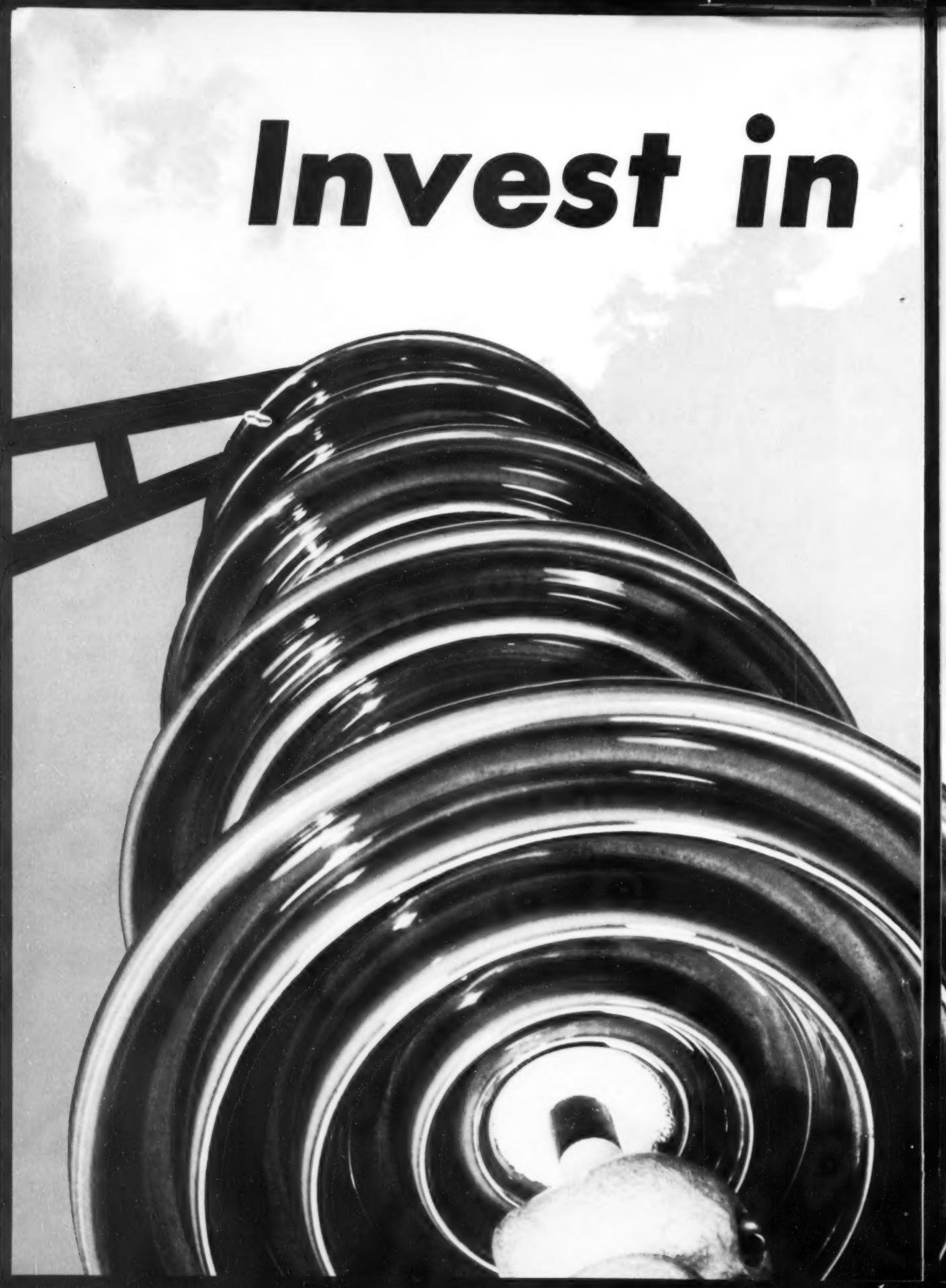
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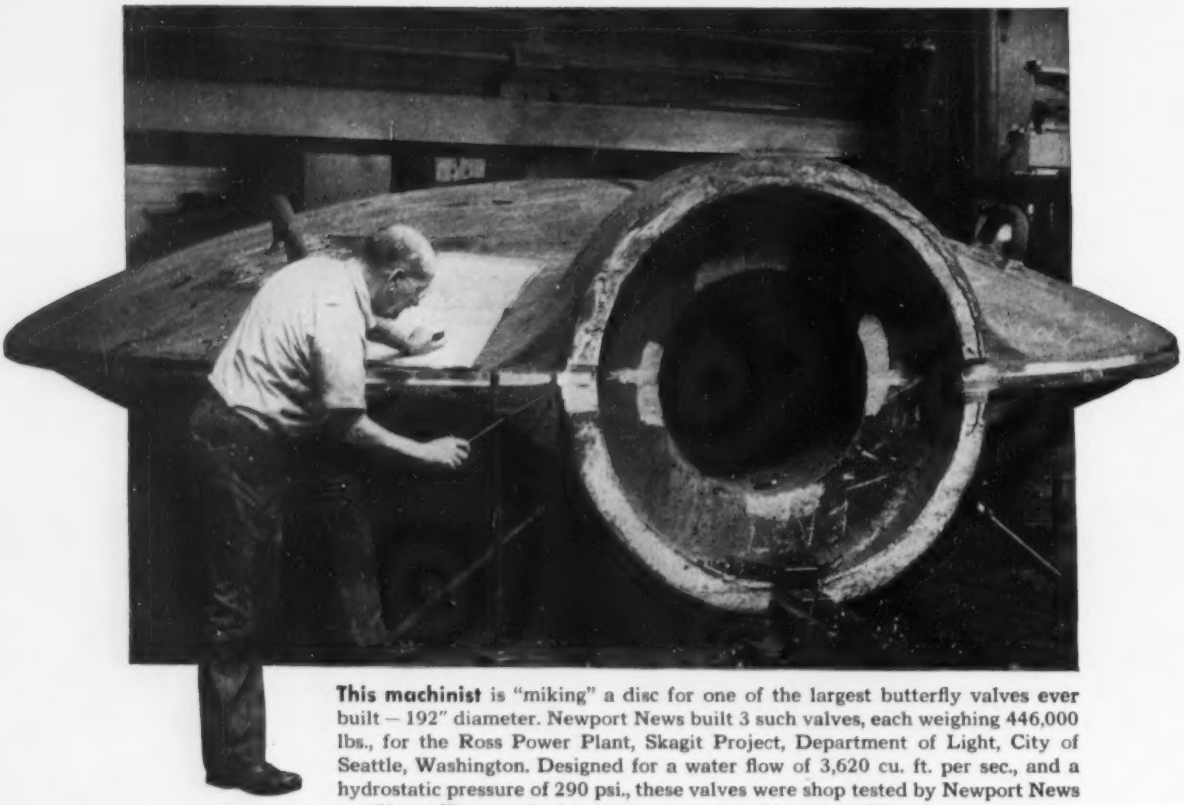

This machinist is "miking" a disc for one of the largest butterfly valves ever built – 192" diameter. Newport News built 3 such valves, each weighing 446,000 lbs., for the Ross Power Plant, Skagit Project, Department of Light, City of Seattle, Washington. Designed for a water flow of 3,620 cu. ft. per sec., and a hydrostatic pressure of 290 psi., these valves were shop tested by Newport News at 450 psi. They are hydraulically operated with oil at 1,500 psi. pressure.

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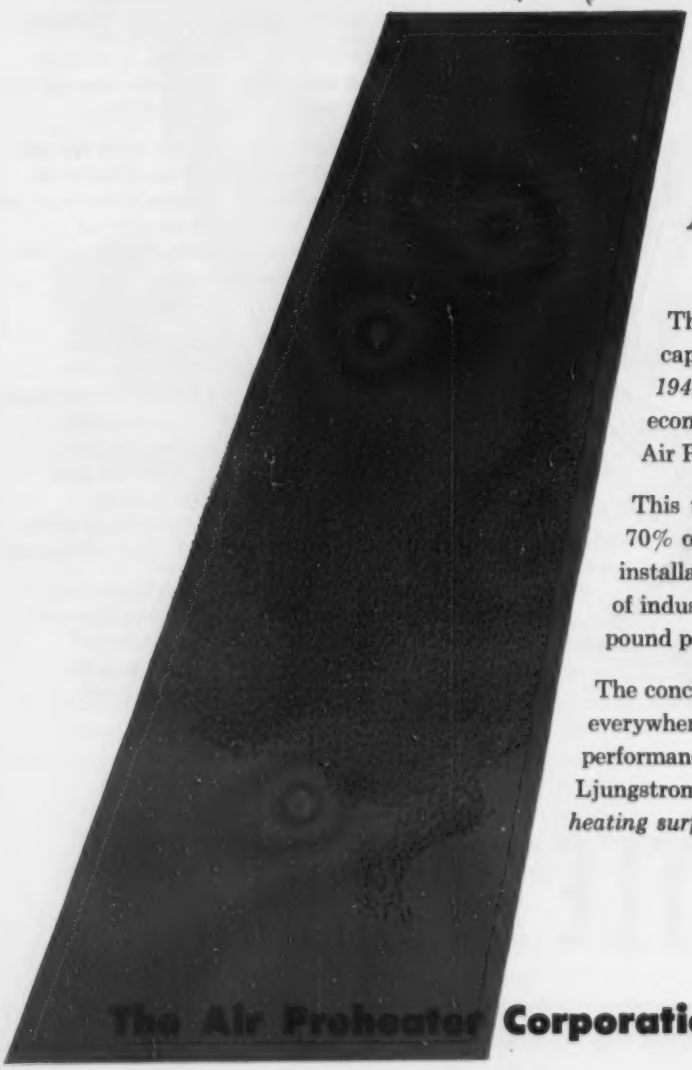

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The conclusion is obvious: Boiler users everywhere realize that the fuel-saving, performance-boosting abilities of the Ljungstrom make it the *most economical heating surface on the modern boiler.*

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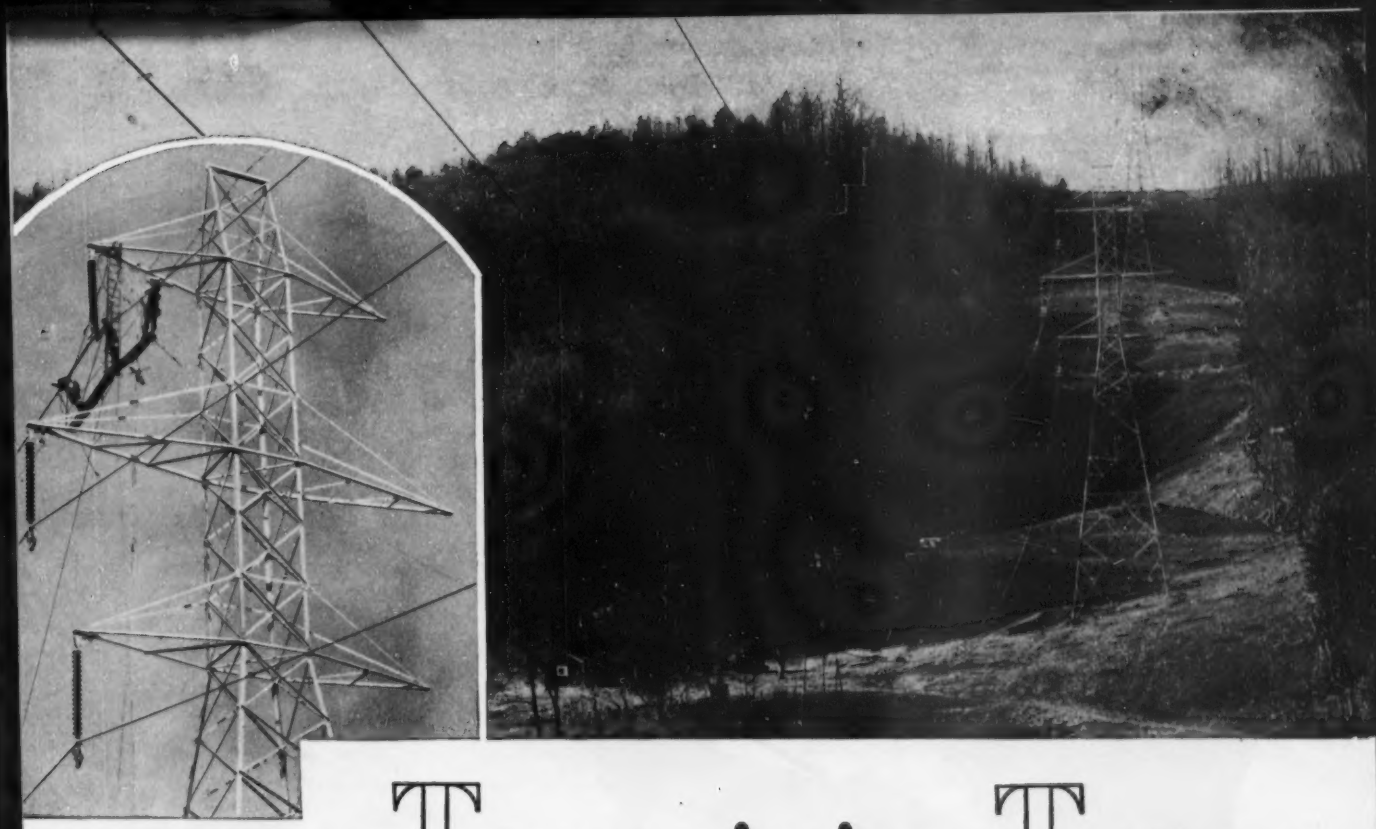

Transmission Towers

designed to carry any load ...to fit any terrain!

Recent high voltage line towers by AMERICAN BRIDGE

Appalachian Electric Power Co.
Ohio Power Company
Public Service Company of Indiana
Duquesne Light Company
Dayton Power and Light Company
Cincinnati Gas & Electric Company
Detroit Edison Company
Toledo Edison Company
Idaho Power Company
Indiana & Michigan Electric Co.

AMERICAN BRIDGE steel towers carry many thousands of circuit-miles of transmission lines across this great land. Scaling the heights of rugged mountains; through marshy lowlands, traversing every conceivable kind of terrain, these steel transmission towers are helping make America's great power distribution system the world's best.

American Bridge towers are made to order for every type of transmission line service. They are designed for simplified erection on level, side-hill, or rocky butte sites. They are engineered for heavy-duty service under the severest climatic conditions.

Incorporating special design features such as steel grillage earth anchors and variable leg extensions, American Bridge towers make possible important savings in time, labor, and material costs.

The technical knowledge and experience American Bridge has acquired in more than fifty years of designing, fabricating and erecting towers may be just the answer to your problems. Our engineers welcome an opportunity to figure on your requirements. Just write our nearest office.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL CORPORATION
GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in: AMBRIDGE · ATLANTA · BALTIMORE · BIRMINGHAM · BOSTON · CHICAGO
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AMERICAN BRIDGE

USS

UNITED STATES STEEL

You just can't miss with

Tiger Brand

Electrical Wire and Cable

Varnished Cambric

Tiger Brand Varnished Cambric Cable is the most economical way to transmit large blocks of power short distances.

Amerclad

To withstand physical abuse, moisture, sun and oil, use Tiger Brand Amerclad for all sorts of portable equipment.

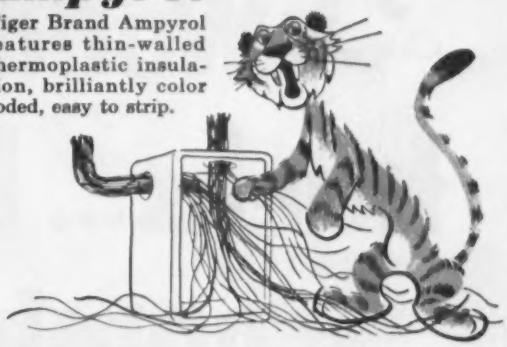
Amerbestos

Tiger Brand Amerbestos is a true *quality* heat resistant material. The asbestos is *felted* for greater durability.

Submarine For underwater power distribution, there's a Tiger Brand Submarine Cable to withstand any operating condition.

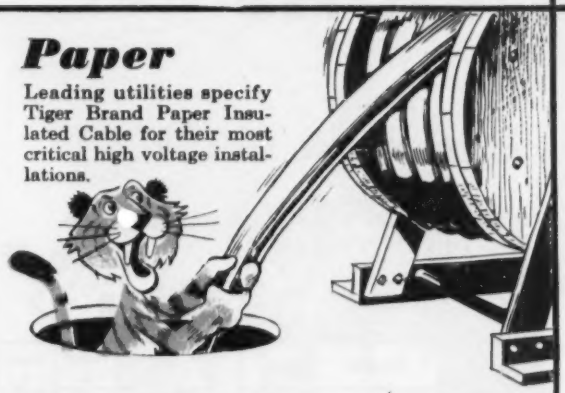
Ampyrol

Tiger Brand Ampyrol features thin-walled thermoplastic insulation, brilliantly color coded, easy to strip.



Paper

Leading utilities specify Tiger Brand Paper Insulated Cable for their most critical high voltage installations.



American Steel & Wire *specializes* in wire and cable that must withstand abusive service. No matter what kind of operating condition you may have, there is probably a *standard* Tiger Brand Wire or Cable that will give you better service than you ever dreamed of.

Send the coupon and outline your problem. We'll see that you get service—*fast.*

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A STANDARD TIGER BRAND CABLE FOR EVERY SPECIAL JOB

- asbestos wire and cable
- mold cured portable cord
- aerial, underground and submarine cable
- shovel & dredge cable
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- machine tool & building wire
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U·S·S Tiger Brand ELECTRICAL WIRE & CABLE

USS

UNITED STATES STEEL

World's best trucks... by actual comparison!

Most powerful low-tonnage truck engine!

Here's proof

Now Power-Dome V-8 delivers sensational 145 hp. . . . more than any other low-tonnage truck engine

	DODGE	TRUCKS F	I	G	C
Max. HP. of leading ½-, ¾-, 1-ton trucks	145-hp.	130-HP.	126-HP.	125-HP.	112-HP.
HP. per cu. in. displacement	.601	.544	.524	.503	.476

Best truck visibility!

Facts prove it

MAKE	DODGE	TRUCK F	TRUCK I	TRUCK G	TRUCK C
Windshield Area	951 sq. in.	938 SQ. IN.	841 SQ. IN.	728 SQ. IN.	728 SQ. IN.
Total Vision Area	2261 sq. in.	2103 SQ. IN.	1705 SQ. IN.	1890 SQ. IN.	1890 SQ. IN.

Sharpest turning trucks!

and here's the proof...

Make of ½-ton Pick-Up	No. of ft. for U-Turn
DODGE	**36¾'**
TRUCK F	37½'
TRUCK I	38½'
TRUCK G	41'
TRUCK C	39½'

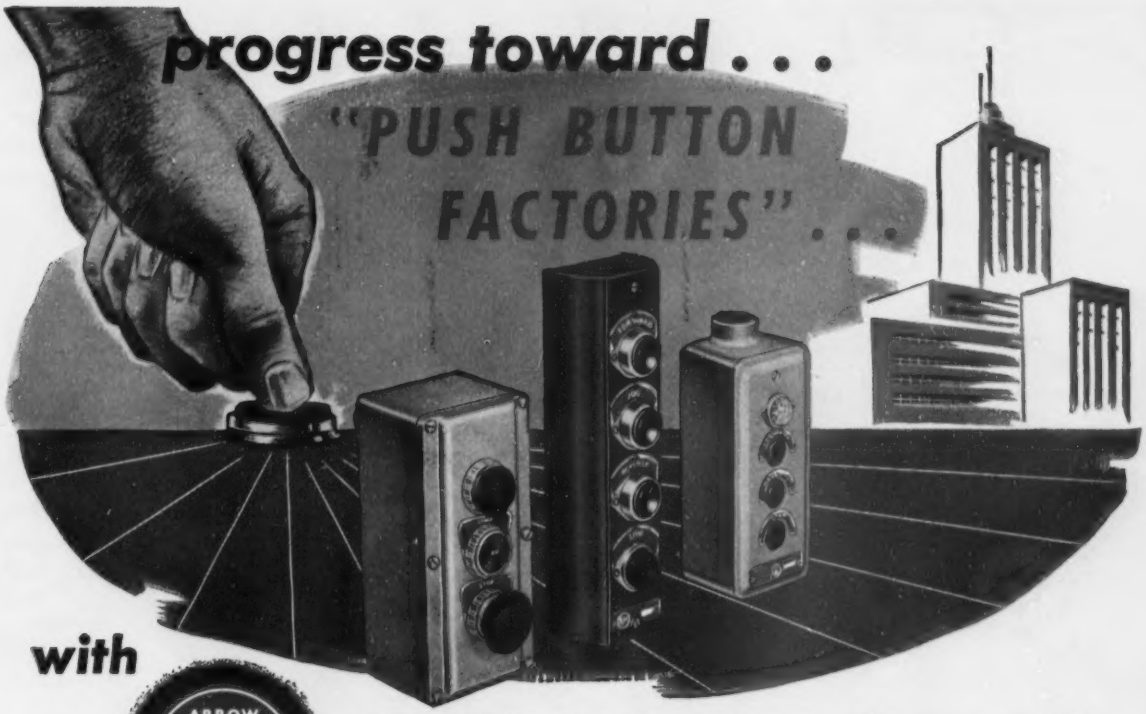
Roomiest truck cab!

Here's proof!

Make of Truck	Hip-room	Shoulder-room	Seat Height
DODGE	**61¾"**	**58⅜"**	**16"**
TRUCK F	60¾"	56⅛"	15¹¹⁄₁₆"
TRUCK C	60"	55½"	14⅛"
TRUCK G	60"	55½"	14¼"
TRUCK I	58⅛"	57"	13⅝"

DODGE "Job-Rated" TRUCKS

ASK US TODAY ABOUT A BETTER DEAL FOR THE MAN AT THE WHEEL!



with

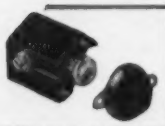
ARROW AH HART

ARROW-HART *Interchangeable* PUSH BUTTON CONTROLS

PUSH BUTTONS

SELECTOR SWITCHES

PUSH-PULL or PUSH-AND-TURN BUTTONS



PILOTS

The trend in industry is toward complete automation . . . "Push Button Factories". The greater *your* progress toward automation, the greater will be your need for Push Button Controls that can be assembled easily and quickly to meet ever-changing conditions. A-H Push Button Controls fill this need completely. They are completely interchangeable within the 3 basic lines offered . . . STANDARD DUTY . . . HEAVY DUTY . . . OIL TIGHT . . . and are equally adaptable to local or remote control.

Advancement toward automation means greater centralization of control . . . and creates a demand for maximum performance in minimum space. A-H control units are tailor-made for this job. A large number can be assembled in special small-size, space-saving panel boards. And, like all A-H controls, these units set new standards for dependability.

STANDARD DUTY LINE . . . Compactness assures easy mounting in convenient locations. Suitable for use under all usual operating conditions up to 600 volts.

HEAVY DUTY LINE . . . Larger, sturdily constructed with heavier contacts, they successfully meet challenge of tough operating conditions. Ideal wherever heavy control currents must be handled with unusual frequency.

OIL TIGHT HEAVY DUTY LINE . . . When control stations are positioned on machine tools and other equipment where they will be convenient to the operator but may be sprayed or flooded with cutting oil or similar fluids, these oil tight controls are the answer.

MAIL COUPON TODAY FOR FREE LITERATURE THAT GIVES COMPLETE DETAILS

SINCE ARROW AH HART 1890

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Offices, sales engineers and warehouses in: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco. In Canada: Arrow-Hart & Hegeman (Canada) Ltd., Mt. Dennis, Toronto. In England: Arrow Electric Switches, Ltd., Ealing, London W5.

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ENCLOSED SWITCHES • APPLIANCE SWITCHES

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EW

Seventeen years ago

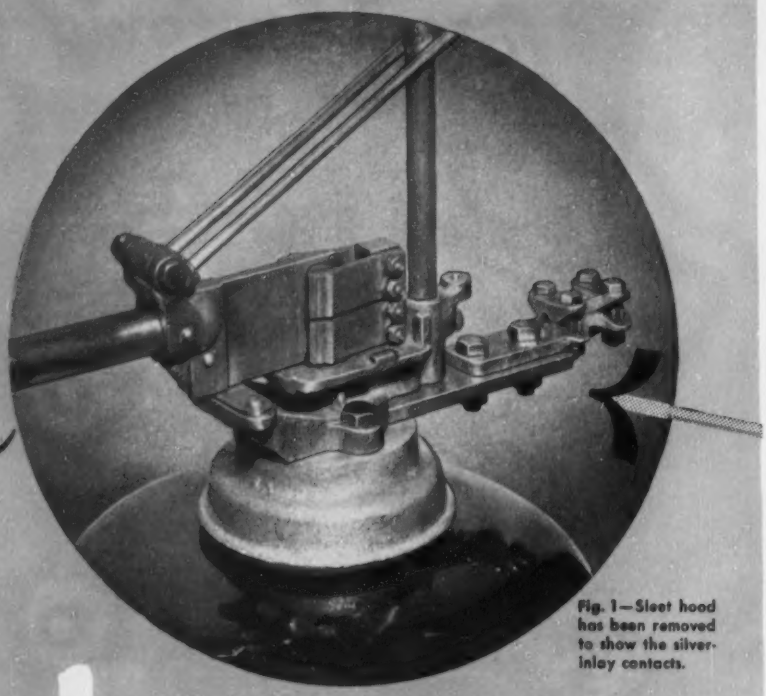

Fig. 1—Sleet hood has been removed to show the silver-inlay contacts.

HI-VOLTAGE STANDARDIZED ON SILVER-TO-SILVER CONTACTS

here's why . . .

1 **SILVER is by far the BEST** conductor of electricity of all metals.

2 **SILVER assures ZERO MAINTENANCE** of contacts because the oxides and sulfides of silver are, for practical purposes, as efficient conductors of electricity as silver itself. Fig. 4 on the opposite page shows the resistance characteristics of various types of contacts.

3 **SILVER-TO-SILVER contacts have LESS** friction. Recent tests in our Laboratory show that the Coefficients of Friction of various metals used as switch contacts are:

Copper against Copper —.177
Copper against Silver —.174
Silver against Silver —.160

4 **SILVER means TROUBLE-FREE** performance. In over seventeen years, Hi-Voltage records do not disclose a single case in which a Customer has ordered a set of *Silver* contacts for replacement. And Hi-Voltage Switches are operating in all climates and atmospheres.

HI-VOLTAGE

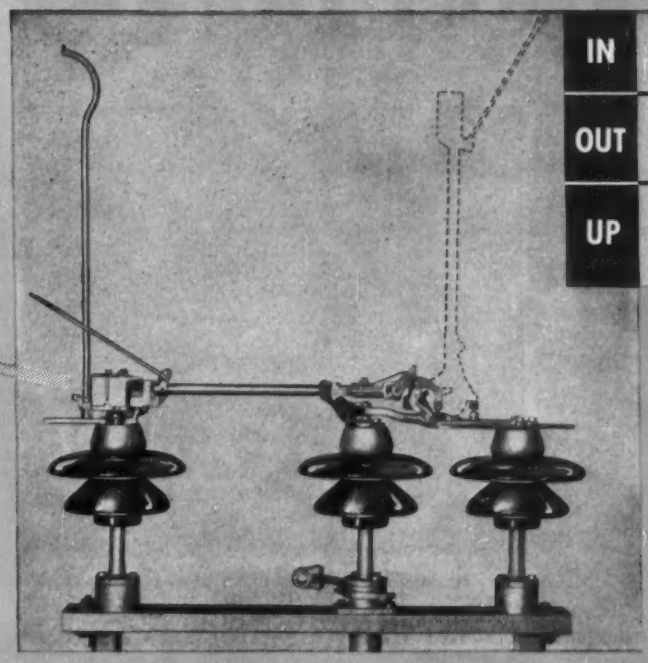

Fig. 2

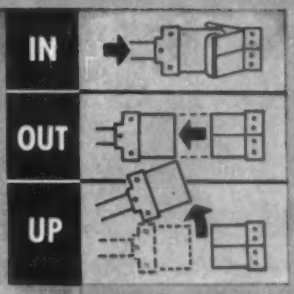

Fig. 3

EXCLUSIVE "IN-OUT-UP" ACTION

When closing, switch blade *pushes* directly and horizontally into the silver-inlay contacts. When opening, switch blade *pulls* directly and horizontally from the silver-inlay contacts. Then, the switch blade is automatically lifted to the vertical position by the powerful operating mechanism. *There is no twisting or turning.*

SILVER'S THE ANSWER . . .

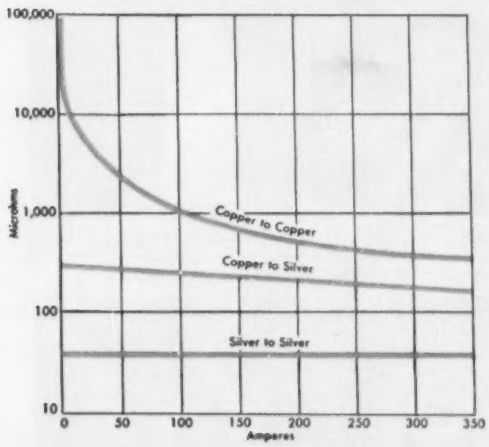

Fig. 4—When copper-to-copper, copper-to-silver and silver-to-silver contacts are oxidized or sulphided, their resistances change as shown above. Note the CONSTANT and LOW resistance of Silver-to-Silver Contacts.

Fig. 5

These Hi-Voltage silver-inlay contacts (unretouched photograph) underwent six short circuits of from 51,000 to 61,000 amperes . . . just about three times the NEMA test requirement. They are unmarked and are good enough to be part of a new switch.

HI-VOLTAGE EQUIPMENT COMPANY

4000 EAST 116TH STREET • CLEVELAND 5, OHIO

Rigid testing of *Explosion-Proof* CONDULETS*

assures safety and long dependable service

Crouse-Hinds extensive laboratories and modern manufacturing combine to give you top quality

Laboratory testing is one of the key operations in the production of electrical equipment of the highest quality. Crouse-Hinds laboratories are equipped with the latest scientific instruments and staffed with expert technicians.

Products are constantly tested to make sure that they are being made to withstand field conditions. New devices are tested to predetermine their meeting or surpassing the requirements of Underwriters' Laboratories.

The photographs at the right show three of the many testing operations that are done in the Electrical Laboratory. It is equipped with apparatus for making both alternating and direct current tests, heat tests, pressure tests and many others.

Close cooperation between Crouse-Hinds laboratories and manufacturing departments is one of the reasons why Condulets have been the "Standard of Quality" for nearly fifty years.

Specify CONDULETS on every job. They're made right... to serve you better... and last longer.

When quality counts
... you can count on Condulets

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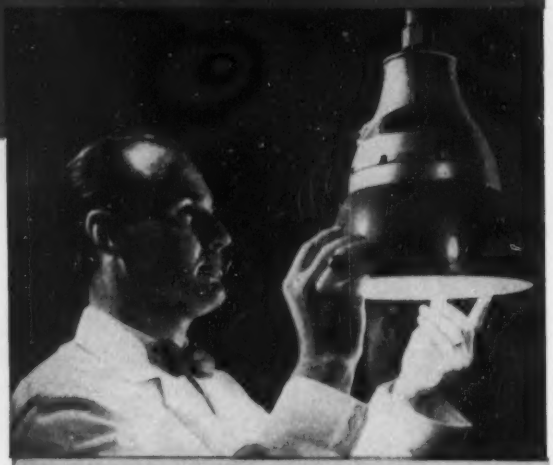
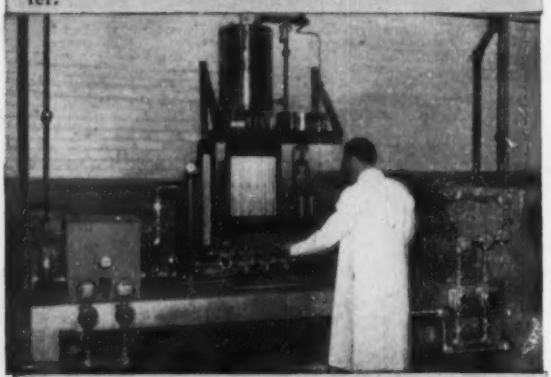
CONDULET
First in the field
STANDARD OF QUALITY

*CONDULETS are made only by CROUSE-HINDS

A Nationwide Distribution Through Electrical Distributors



Probing for maximum exterior operating temperature on a Type EVA Explosion-Proof Lighting Fixture using a multiple point recording potentiometer.



Adjusting carburetors and flow meters to create a predetermined explosive mixture within an explosion-proof Condulet for an explosion test.

Photographing the pressure wave in the Oscilloscope to determine the maximum explosion pressure within an explosion-proof Condulet that is behind the concrete wall.

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

Tight, uniform loads of J. Neils "Double-Life" treated poles are insured by using a 40-ton capacity crane in rail car loading operations.

Big Poles Require Big Equipment

Here at the Pole Division of J. Neils, daily production reaches 35,000 lineal feet of pole material. It's a *big* job that requires *big* equipment, *big* know-how in pole manufacture, *big* natural resources and *big* experience in the forest products industry.

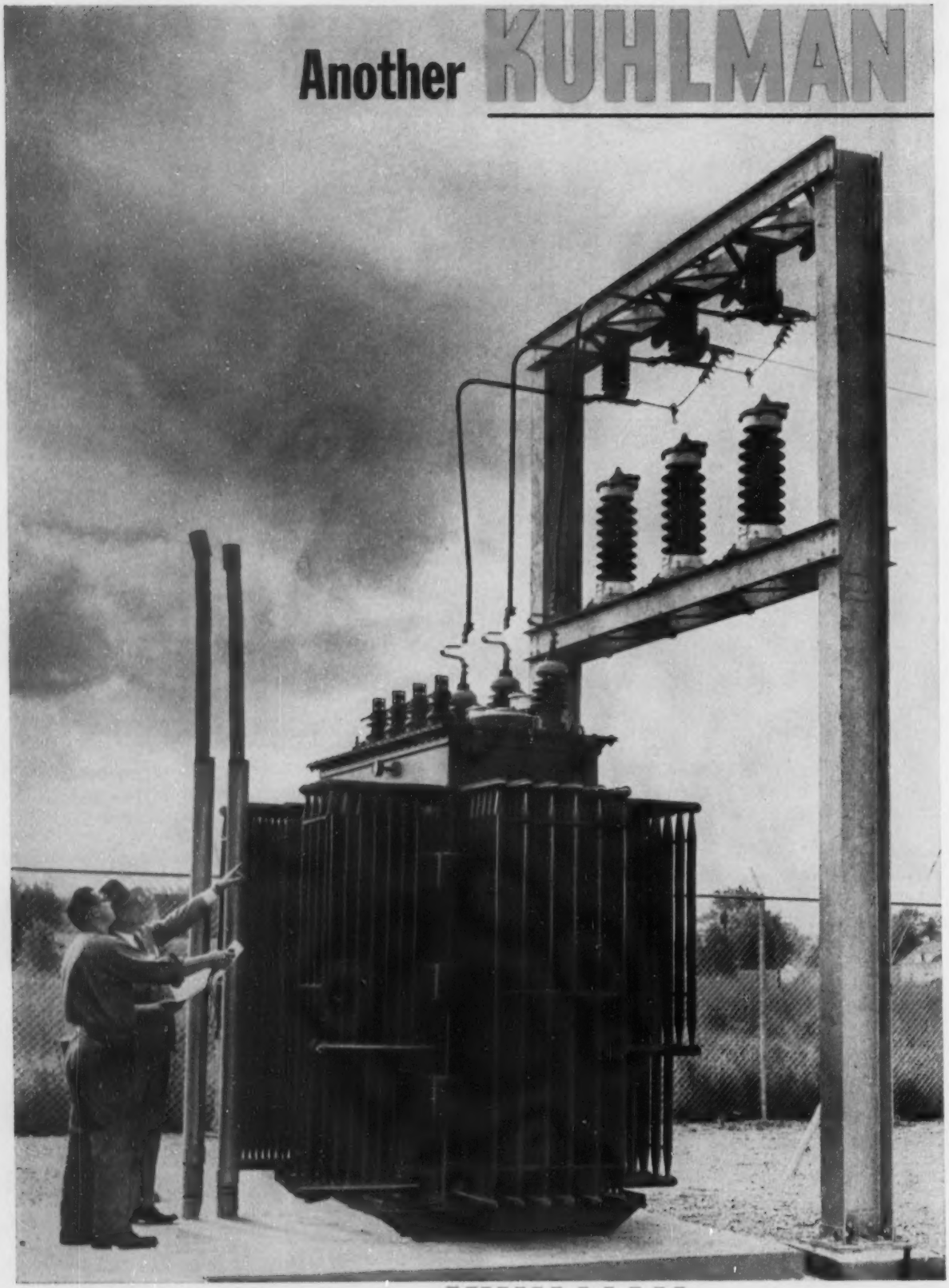
Much of the finest transmission pole timber in the U. S. grows on the 200,000 acres of forest land owned by J. Neils in western Montana. We concentrate on the manufacture of poles from Western Larch, Lodgepole Pine and Douglas Fir. We have been in business since 1895 and it is our privilege to serve utility companies, large and small, in various sections of the country.

An illustrated folder on J. Neils "Double-Life" poles (penta or creosote treated), and information regarding their application to your requirements, will be furnished gladly.

J. Neils Lumber Company

Pole Division: **Libby, Montana**

J N



KUHLMAN ELECTRIC COMPANY

SIXTY YEARS OF PROGRESS IN THE ELECTRICAL INDUSTRY

power transformer goes into service

After over sixty years of supplying the nation's leading utilities with dependable transformers, Kuhlman still remains exclusively an independent transformer manufacturer. As a result of this specialization, Kuhlman has been able to refine the art of transformer craftsmanship and build a reputation for reliability and quality manufacturing — just one of the many reasons for selecting a Kuhlman Power Transformer.

Today, Kuhlman offers a complete line of small Power Transformers to serve your utility's expanding residential and industrial needs. The photograph at the left, showing a 2500 KVA 3-phase Power Transformer being installed to serve a new mid-west suburb is typical of the preference shown by satisfied Kuhlman customers who consistently reorder Kuhlman Transformers because of the record of their past performance.

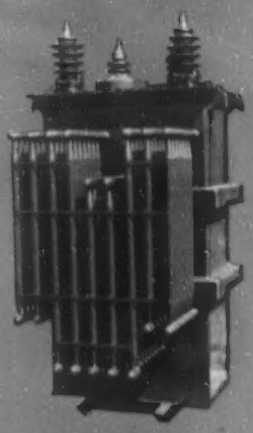
Select the Kuhlman Transformer that best suits your requirements and join the many old and new Kuhlman friends who specify Kuhlman Transformers because of these and many other time-tested features.

core and coil

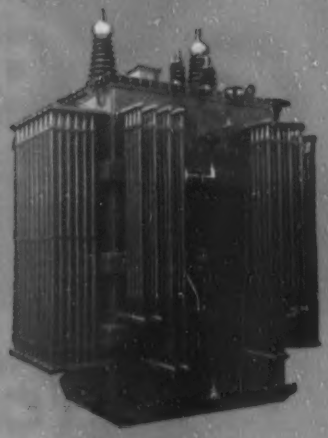
1. All connections inside coil are brazed. Brazed connections used for heavy bus outside the coil.
2. Tap changers of rugged construction give high overload capacity and low temperature rise at contact.
3. Tank anchor pads lock core to tank.
4. Steel clamping rings hold coils solidly in place.

tank

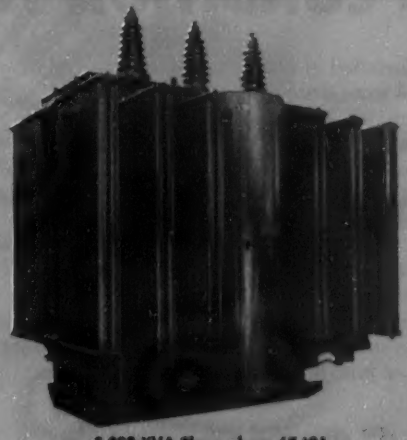
1. Tanks constructed of heavy steel plates meet latest NEMA ASA standards.
2. Seal Tanks minimize deterioration of oil.
3. Transformers can be vacuum filled in the field.
4. Metal stops in cover to assure proper gasket compression.



833 KVA Single phase 34.4 KV



3,333 KVA Single phase 67 KV



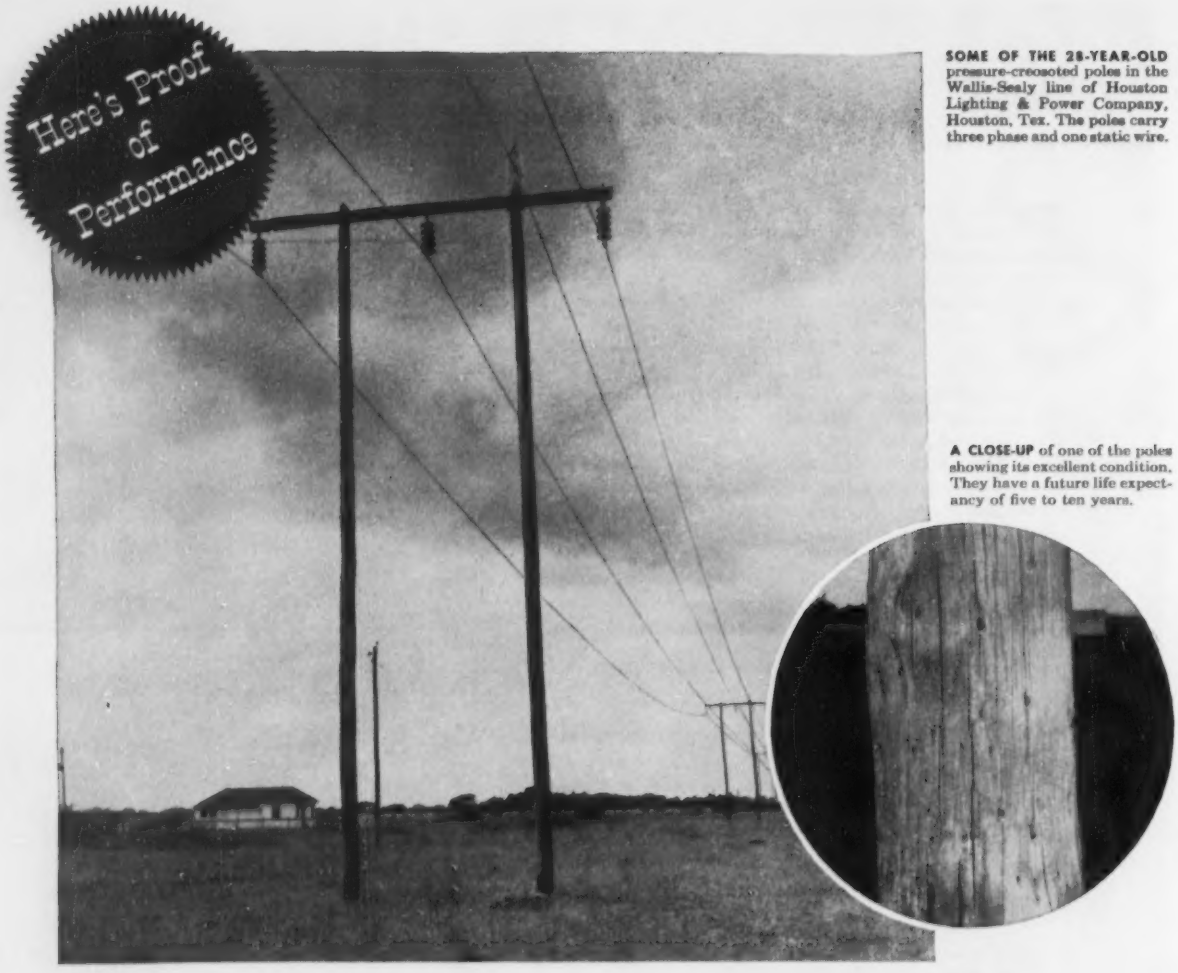
5,000 KVA Three phase 67 KV

1,677 KVA Single phase 67 KV

141

BAY CITY, MICHIGAN • SOUTHERN DIVISION • CRYSTAL SPRINGS, MISSISSIPPI

EXPORT REPRESENTATIVE: International Standard Electric Corp., 15th Floor, 50 Church Street, N.Y. 7, N.Y. • CABLE ADDRESS: Microphone, N.Y.



SOME OF THE 28-YEAR-OLD pressure-creosoted poles in the Wallis-Sealy line of Houston Lighting & Power Company, Houston, Tex. The poles carry three phase and one static wire.

A CLOSE-UP of one of the poles showing its excellent condition. They have a future life expectancy of five to ten years.

247 pressure-creosoted poles installed in 1926

...233 STILL IN GOOD CONDITION TODAY

● A combination of warm moist climate and the prevalence of termites makes the use of pressure-creosoted poles a necessity for Houston Lighting & Power Company. It means the difference between five years of life for an untreated pole to 30 to 35 years for a treated one.

A good example of sound pole line planning is found in the 11.8 miles of 66 KV outer loop between the Texas communities of Wallis and Sealy—all pressure-creosoted poles. Here 247 poles were installed in 1926 (actually 260—but 13 were since replaced to obtain greater height). Today, after 28 years of exposure to weather and wood's natural enemies, 233 poles—or over 94% of the original line—remain in good condition, with a future life of 5 to 10 years.

Houston Lighting & Power Company first used pressure-creosoted poles in 1921, and conversion has been complete now for more than 20 years. Southern yellow pine and fir poles are treated with Creosote to 10 pounds retention.

You can count on uniformly good results when your poles are treated with USS Creosote—the product of United States Steel's tar distilling operations. For more information on USS Creosote and the long pole life it assures, contact our nearest Coal Chemical sales office or write directly to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

USS CREOSOTE

4-1466

UNITED STATES STEEL

FULL GRIPPING SURFACE

with BLACKBURN *Aluminum* SERVICE WEDGE CLAMP

Conductor is in Contact with Wedge for Entire Length of Slider

This longer-contact gripping surface adds years of trouble-free life to the connection. *It's easily installed.*

- **Stainless steel bail can be snapped on and off without tools. Its strength exceeds rated breaking strength of conductors.**
- **Removable aluminum slider allows clamp to be installed without threading through clamp.**
- **Drop wire can be pre-sagged and cut to exact length—saves conductor—saves time.**
- **Clamp can be attached to bare neutral at any point in the span.**

The BLACKBURN Aluminum Service Wedge Clamp covers a conductor range of 2-6 sol, Aluminum and 4-6, ACSR. The wedge and bail are Stainless Steel—the removable slider, heat-treated Aluminum.

Available through electrical wholesalers everywhere

JASPER BLACKBURN CORPORATION
35 Madison Street • St. Louis 6, Mo. • Phone MAin 1-2821

Here is much needed help with all your Accounting

IBM's new magnetic drum machine, the "650", promises really big things to utilities in *all* their accounting.

Take, for example, customer accounting. In a single operation the "650" performs all bill computation and revenue analysis. This includes an automatic high-low check, estimated bills, revenue summaries, bill frequency summaries, and accounts receivable control information. The billing cards produced in this operation may contain *aged arrears* as well as current billing data.

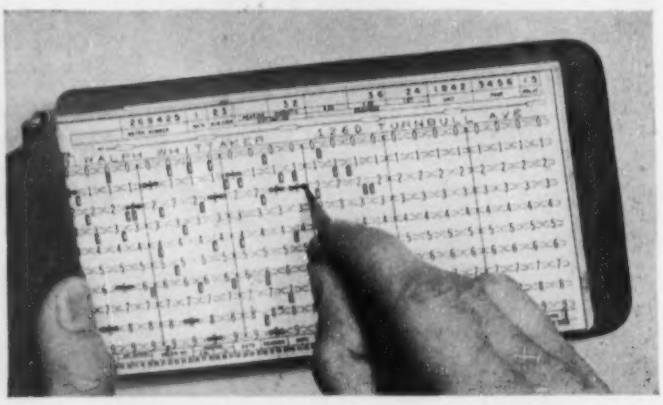
How is all this possible?

Because of its tremendous storage capacity of 20,000 digits, including as many as 2,000 program steps; its automatic table look-up, self-checking features, ability to calculate and distribute data without disturbing the original sequence of the cards, plus many other features.

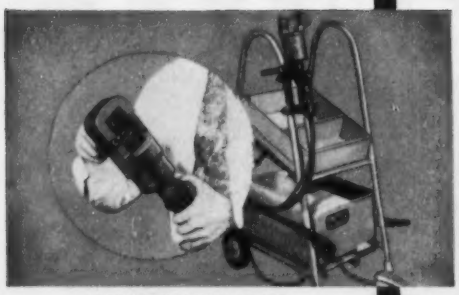
If you haven't already talked about the "650" with one of our representatives, call him today for details.

IBM
TRADE MARK

INTERNATIONAL BUSINESS MACHINES
590 Madison Avenue, New York 22, N. Y.

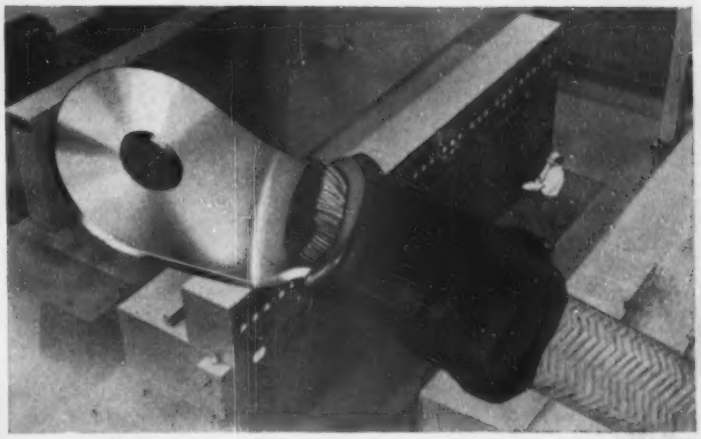


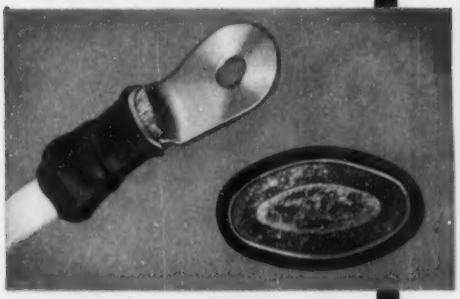
AMP FIRST IN SWITCHGEAR!



NEW DYNA-CRIMP TOOL

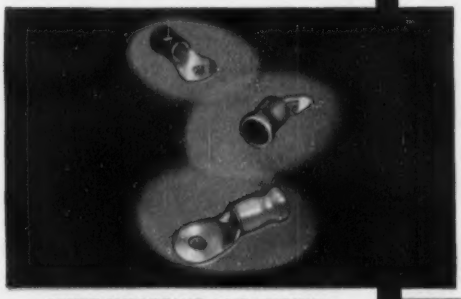
New, powerful, DYNA-CRIMP tool features fast positive crimping action and easily-opened swivel head. Crimping heads can be changed easily. A-MP DYNA-CRIMP tool gives maximum portability with remote control operation. Interchangeable dies are available for use with A-MP's complete line of Aluminum and Flag terminals. Shown above with moveable cart to transport power unit providing maximum flexibility for Bench-Production line use.





BONDING FEATURE MOST IMPORTANT

Bonded insulation is the most important factor *in producing a successful insulated terminal.* The positive and complete bond of the insulation to the terminal sleeve insures uniform insulation thickness under crimping pressures, and therefore transmits this pressure evenly to the center of the crimp area. With this precision-engineered A-MP crimp and BONDED insulation you can be sure of maintaining proper dielectric and tensile values in the finished connection. More intimate contact achieved by confining, over a greater area, terminal and wire under intense crimping pressure.



OTHER IMPORTANT A-MP "FIRSTS"

Completely separate metallic reinforcing ring grips wire insulation, prevents exposure of conductor during sharp bends, cable fatigue caused by flexing and vibration and forms a barrier to foreign objects coming in contact with current carrying members. New helical tongue design gives maximum strength with minimum weight.

SIZES 8 THROUGH 4/0

Ampli-Bond Trade-Mark

THE ONLY LARGE SIZE TERMINAL WITH BONDED INSULATION!

WITH INSULATION SUPPORT AND SUPERIOR A-MP CONFINED CRIMP.

10 distinctive and distinguishable features make precision-engineered AMPLI-BOND terminals the best quality insulated termination for copper wire.

- INSULATION WITHSTANDS A MINIMUM OF 6000 VOLTS!
- INNER COPPER SLEEVE FOR STRENGTH AND VIBRATION RESISTANCE
- FULLY INSULATED METALLIC REINFORCING RING GRIPS INSULATION
- COLOR CODED FOR RAPID IDENTIFICATION
- BRAZED BARREL SEAM
- SUPERIOR A-MP CONFINED CRIMP
- INNER BARREL DIMPLED FOR INCREASED TENSILE STRENGTH
- COPPER TERMINAL BODY ELECTRO-TINNED FOR HIGH CONDUCTIVITY
- BONDED INSULATION
- PROOFMARK FOR POSITIVE IDENTIFICATION

Here is a large size terminal that presents to the users of heavy duty wire the same quality connection that has made A-MP famous for PRE-INSULATED type terminals throughout the industry. Write today for information about AMPLI-BOND and new powerful AMP DYNA-CRIMP portable pneumatic-hydraulic crimping tool.

AMP Trade-Mark Reg. U.S. Pat. Off. © AMP

Find out about the new AMP "CREATIVE APPROACH TO BETTER WIRING"

...An evaluation survey without cost or obligation.

Aircraft-Marine Products, Inc.

2100 Paxton Street, Harrisburg, Pennsylvania

In Canada . . . . Aircraft-Marine Products of Canada, Ltd.

1764 Avenue Road, Toronto 12, Ontario, Canada

Series "C"...

OPERATING FEATURES

1. Bird-proof construction.
2. Easily re-fused with fuse hook (switch stick) when mounted vertically or 20° from vertical.
3. Fuse link leader securely held by positive grip thumb screw and snubbing post.
4. Double hinge mechanism pulls fuse link leader down and out of the tube. This insures quick clearing of low current faults.

CONSTRUCTION FEATURES

1. Conforms to latest NEMA Standards.
2. Has interchangeable fuse holders and load break fuse holders in heavy duty and extra heavy duty ratings. Also has interchangeable disconnecting blades.
3. For extra-heavy duty operation, expendable disc (easily replaced) blows out, giving additional relief to gas pressures built up under heavy faults.
4. Fuse holders use new color coding system, with reflecting tape to simplify night identification.
5. All non-ferrous parts (except for hanger strap).
6. Load break fuse holders use any melting type universal fuse link, even those where the element requires uncoiling before breaking.

a new high degree of reliability

with the new

R&IE

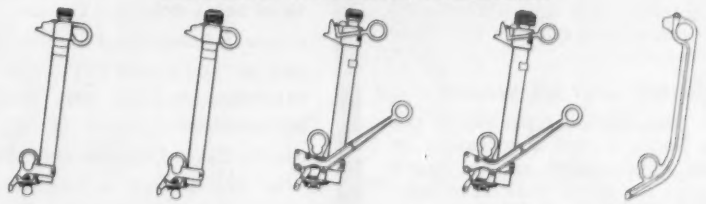
DISTRIBUTION CUTOUT

Here's MORE for your Money -

- **HIGHER INTERRUPTING CAPACITY**
- **POSITIVE LOAD INTERRUPTION**

One Heavy Duty Cutout for standard and Heavy Duty application at no increase in price.

FULLY INTERCHANGEABLE FUSE HOLDERS AND DISCONNECTING BLADE CONFORMS WITH NEMA STANDARDS



1 *Heavy Duty Fuse Holder*

2 *Extra-Heavy Duty Fuse Holder*

3 *Heavy Duty Load Break Fuse Holder*

4 *Extra Heavy Duty Load Break Fuse Holder*

5 *Disconnecting Blade*

INTERRUPTING RATINGS
(Amperes RMS)

Max. Kv Rating	Amp. Rating	Type of Fuse Holder	
		Heavy Duty	Extra Heavy Duty
5.2	100	5,000	10,000
7.8	100	5,000	10,000
15	100	4,000	8,000

The new NEMA 18 Kv (1200 amp.) cutout also available.

R&IE EQUIPMENT DIVISION
I-T-E CIRCUIT BREAKER CO.
GREENSBURG, PA.

STRUCTURES—Steel or aluminum ● TESTING DEVICES ● KIRK KEY INTERLOCK SYSTEMS ● ISOLATED PHASE BUS STRUCTURES ● INTERRUPTER SWITCHES

INDOOR BUS SUPPORTS and BUS FABRICATION ● OUTDOOR BUS SUPPORTS and AIR SWITCHES ● SUBSTATION

NEW CHEVROLET TRUCKS

have what it takes to boost efficiency and bring down costs!

In the next three paragraphs you'll find a few good reasons why you can get more work out of a Chevrolet truck and save money doing it.

INCREASED POWER IS THE FIRST BIG REASON

With Chevrolet's higher compression ratio you've got more power under the hood. Power that results in greater acceleration and hill-climbing ability. Faster starts and acceleration over the day's work save valuable time and increase over-all efficiency. Check the gas mileage, too. With this higher compression ratio, your Chevrolet truck registers *more miles on the job* for each tankful of gas. That's where you start to save money.

BUILT-IN RUGGEDNESS SAVES EVEN MORE

The strength and stamina of more rigid frames, and the special chassis features that pertain to each model—these combine to add extra ruggedness to your Chevrolet truck. Push it hard on the rough jobs; keep it going over long schedules—you'll still find your upkeep costs lower and your Chevrolet trucks lasting a lot longer.

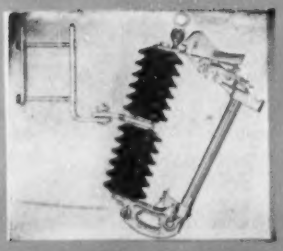
ONE LAST POINT—and maybe the most important to you—you'll find Chevrolet's line of trucks priced the lowest of all! Talk over your needs with your Chevrolet dealer. He'll be glad to give you the facts about the best model for your job. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

MOST TRUSTWORTHY TRUCKS ON ANY JOB! CHEVROLET

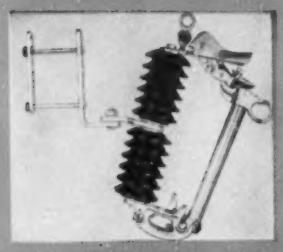
CHEVROLET ADVANCE-DESIGN TRUCK FEATURES

THREE GREAT ENGINES—The new "Jobmaster 261" engine* for extra heavy hauling. The "Thriftmaster 235" or "Loadmaster 235" for light-, medium- and heavy-duty hauling. **NEW TRUCK HYDRA-MATIC TRANSMISSION***—offered on ½-, ¾- and 1-ton models. Heavy-Duty **SYNCHRO-MESH TRANSMISSION**—for fast, smooth shifting. **DIAPHRAGM SPRING CLUTCH**—improved-action engagement. **HYPOID REAR AXLE**—for longer life on all models. **TORQUE-ACTION BRAKES**—on all wheels on light- and medium-duty models. **TWIN-ACTION REAR WHEEL BRAKES**—on heavy-duty models. **DUAL-SHOE PARKING BRAKE**—greater holding ability on heavy-duty models. **NEW RIDE CONTROL SEAT***—eliminates backrubbing. **NEW, LARGER UNIT-DESIGNED PICKUP AND PLATFORM STAKE BODIES**—give increased load space. **COMFORTMASTER CAB**—offers greater comfort, convenience and safety. **PANORAMIC WINDSHIELD**—for increased driver vision. **WIDE-BASE WHEELS**—for increased tire mileage. **BALL-GEAR STEERING**—easier, safer handling. **ADVANCE-DESIGN STYLING**—rugged, handsome appearance.

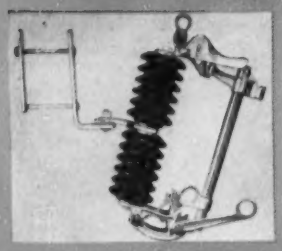
**Optional at extra cost. Ride Control Seat is available on all cabs of 1½- and 2-ton models, standard cabs only in other models. †Jobmaster 261" engine available on 2-ton models, truck Hydra-Matic transmission on ½-, ¾- and 1-ton models.*



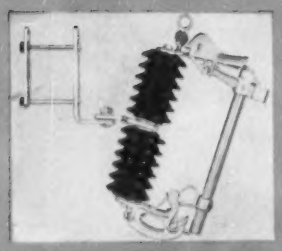
Type 33-D



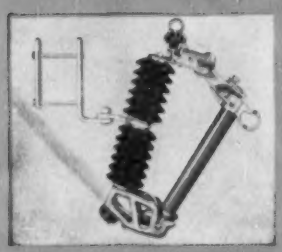
Type 33-DH



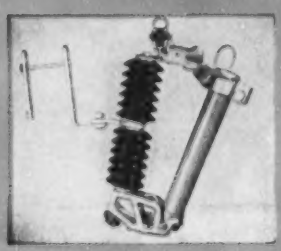
Type L-33-D



Type CV-33-D



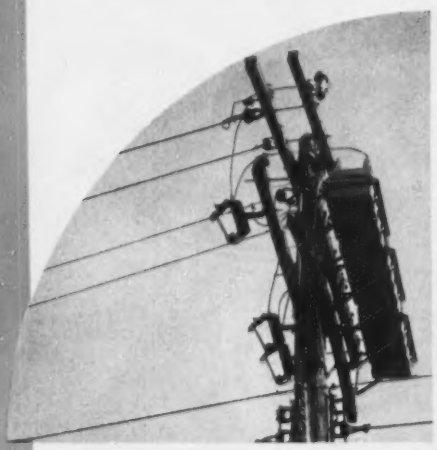
Type H-33-D



Type HH-33-D

58 Combinations

to meet your cutout requirements



Silver plated contacts are now standard on all Southern States cutouts.

No matter what your fusing problems are—excessive load-growth, isolated or special applications, meeting a tight budget, or others—Southern States cutouts will help you lick them. In the 33 series, fifty-eight combinations of voltage, current and interrupting ratings are available.

From this versatile line—ranging from the Type 33-D, to the extra heavy-duty, Type HH-33-D—you can select the cutout that meets your exact requirements.

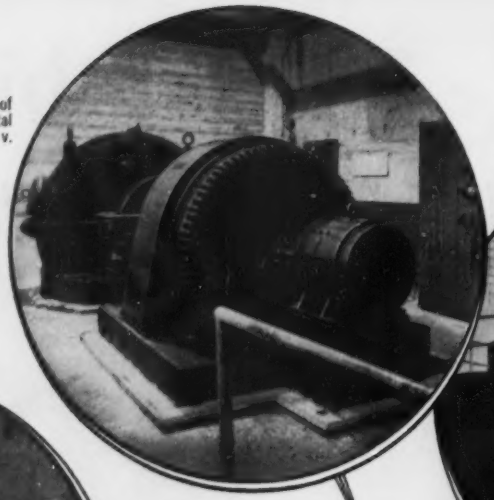
Three methods of tube venting, interrupting ratings from 1,200 to 25,000 RMS amperes and continuous current ratings from 50 to 300 amperes, enable you to choose the cutout you need.

Complete data and information are available in our Bulletin 530-C, which we'll gladly send you on request.

Specify Southern States cutouts and be certain.

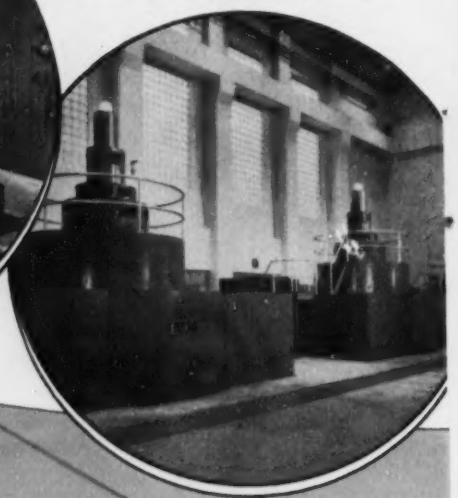
SOUTHERN STATES EQUIPMENT CORP.

HAMPTON, GEORGIA



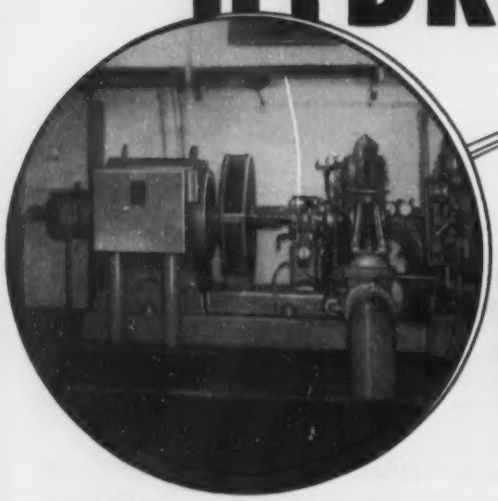
BRITISH COLUMBIA — Port Alice mill of Alaska Pine and Cellulose, Ltd. Horizontal generator rated 2500 kva, 900 rpm, 6900 v.

WYOMING — Kortes Dam. Three 13,333 kva, 240 rpm, 6900 v suspended-type generators.



WYOMING — Heart Mountain Power Plant. Suspended-type generator rated 6000 kva, 450 rpm, 2400 v.

All over the HYDRO-POWER by

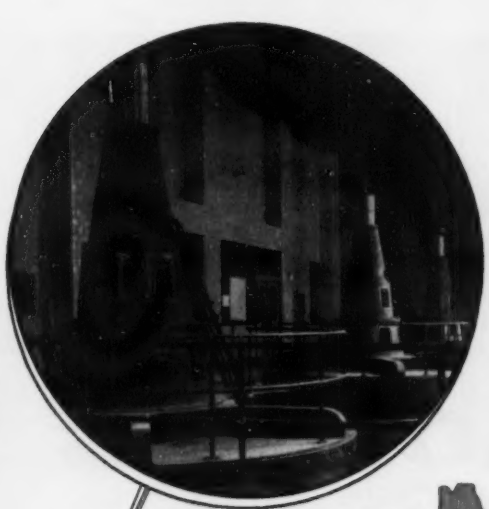


CALIFORNIA — Big Creek 4 plant, Southern California Edison. Horizontal 375 kva, 1200 rpm, 240 v house generator.

COLORADO — Pole Hill Power Plant. Suspended-type generator rated 35,000 kva, 450 rpm, 13,800 v.

OKLAHOMA — Tenkiller Ferry Dam. Two 17,895 kva, 150 rpm, 13,800 v umbrella-type generators.

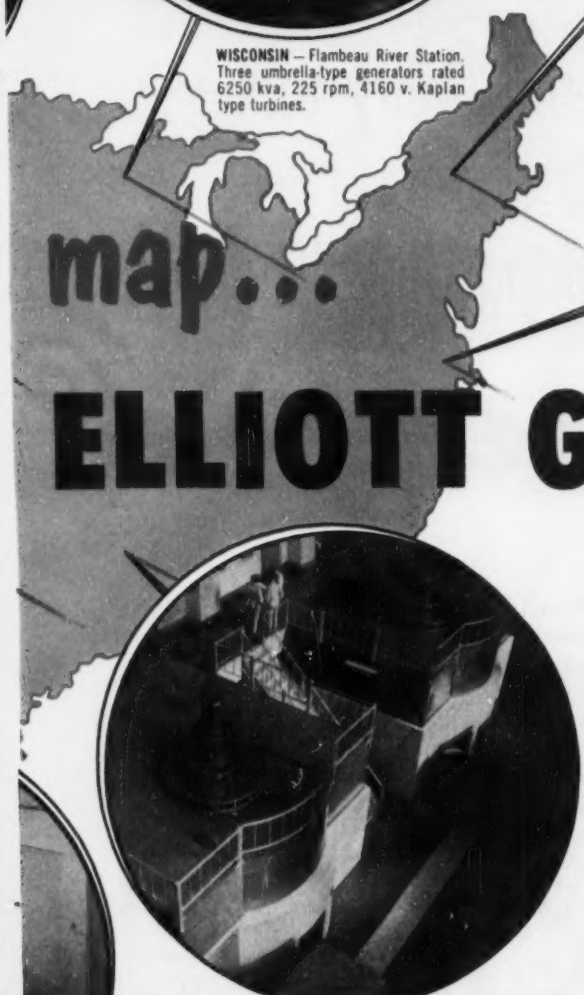
R4-10



NEW YORK — High Falls Plant of New York State Electric and Gas Corp. Two 5000 kva, 514 rpm, 6900 v, suspended-type machines.

NORTH CAROLINA — Queens Creek development, Nantahala Power and Light Co. Horizontal generator rated 1800 kva, 600 rpm, 2400 v.

WISCONSIN — Flambeau River Station. Three umbrella-type generators rated 6250 kva, 225 rpm, 4160 v. Kaplan type turbines.



ELLIOTT GENERATORS

ARKANSAS — Narrows Dam Plant. Two umbrella-type generators rated 9444 kva, 225 rpm, 13,800 v.

Hydraulic-turbine-driven generators by Elliott are operating with gratifying success in many of the largest power projects, as well as in smaller private installations. These generators include horizontal and vertical (both suspended and umbrella) types. They are driven by turbines of all presently manufactured types, including Francis, Kaplan, fixed blade, and impulse. The group of installations illustrated here show that Elliott engineering and manufacturing facilities can adequately meet the widest range of requirements.

For details of these generators, consult your local Elliott Field Engineer or write Elliott Company, Ridgway Division, Ridgway, Pa.

ELLIOTT Company

TURBINE-GENERATORS TURBINES MOTORS GENERATORS DEAERATING HEATERS EJECTORS CONDENSERS COMPRESSORS TURBOCHARGERS TUBE CLEANERS STRAINERS

Now - from

GENERAL MOTORS

a remarkable new electric utility tool – for fringe area interim boosting – powered by a history-making Diesel engine

ELECTRO-MOBILE

SUPPLEMENTARY POWER—as much as wanted—where it's needed—for as long as desired—at a cost per kw. at point of application never before possible—that's the new tool that General Motors now makes available to the electric utility industry.

For interim boosting in fringe areas—for emergency needs—three highly transportable units are ready. And each is powered by the same high-speed, highly reliable, fast-starting engine that, in the General Motors Diesel-Electric locomotives, brought about a whole new concept of public service on American railroads.

Now, with specially designed generators and controls in completely integrated units, Electro-Mobile Power brings dependable production of current for boosting or emergencies—assuring maximum kilowatt capacity with minimum capital investment!

All components, specially built for compatibility with each other, are our own products. All service and parts are had from a single source—already available nationwide.

Here, from two decades' experience in building Diesel-Electric locomotives—equipment that right now equals, in capacity, *one-sixth* of all the country's installed electrical generating equipment—is a versatile and economical means to meet many of the perplexing and expensive problems of the fringe areas. We'd be glad to discuss your specific needs.

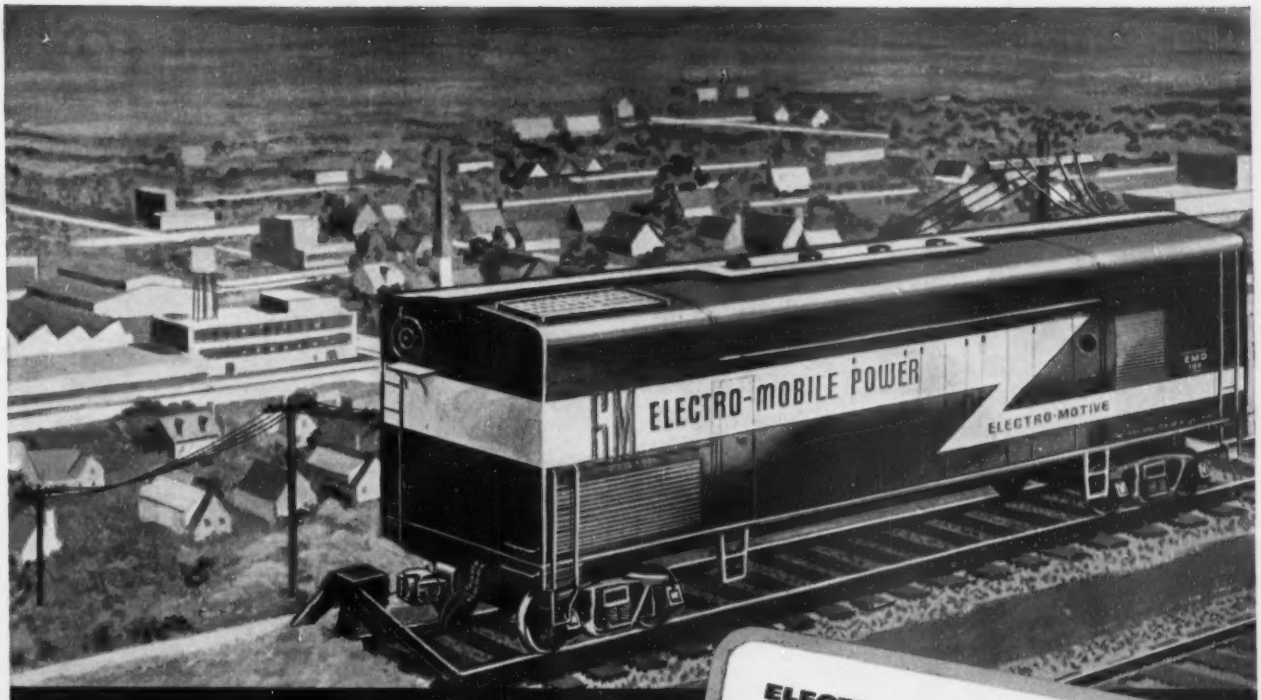
Sold and serviced directly through a manufacturer's organization.

Electro-Motive Division offices located in: New York City, Chicago, Jacksonville, St. Louis and San Francisco.

Electro-Motive Division

GENERAL MOTORS

LA GRANGE, ILLINOIS



RAIL CAR 1000, 750 and 500 kw. units for use on sidings or placed on piers for semi-permanent use.

POWER

ELECTRO-MOBILE POWER

FEATURES INCLUDE:

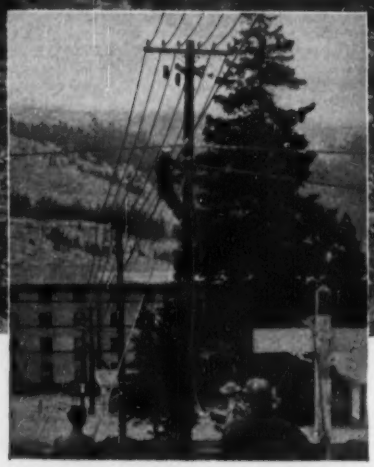
- Remote control starting and stopping
- From starting to full load within 45 seconds
- Automatic synchronization with line in phase, frequency and voltage
- Inherent 25% overload capacity
- Full protective equipment, including 3-phase surge capacitors, lightning arresters, over-current relays, field failure relay
- Complete self-operation can be provided
- Ability to meet higher capacity needs by unit multiplication
- Complete national parts and service availability

TRUCK TRAILER 500 and 350 kw. units to move on highways to desired sites

PORTABLE UNIT 1000, 750, 500 and 350 kw. capacities for permanent or semi-permanent installations

THE WORLD'S HIGHEST COMMUNITY

Reflected sunlight makes the primary cable look like a white line running down the slopes of Mt. McNamee. Except for a section of conduit that is buried beneath the road, at center, the entire 4300 ft. of cable between summit and mine lies exposed on the ground.



Stringing RG-11U cable on existing telephone poles. RG-11U was used as secondary lead, and as drop cable to individual outlets.

TV SYSTEM IS ROUGH ON CABLE

COAXIALS MUST WITHSTAND RUGGED TERRAIN, SNOW, HIGH WINDS, AND LIGHTNING IN THE 13,783 FT. INSTALLATION AT CLIMAX, COLORADO

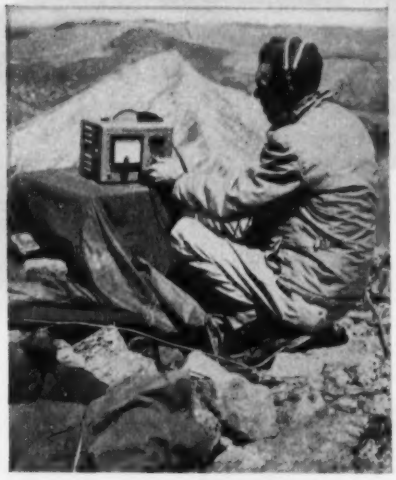
This unique TV distribution system, provided for its employees by the Climax Molybdenum Co., makes use of two transmission cable types. Both are insulated with BAKELITE Polyethylene and jacketed with BAKELITE Vinyl Plastic – providing service that underscores the outstanding electrical and mechanical properties of these wire covering materials.

From the antenna site at the peak of nearby Mt. McNamee, the primary lead —Federal K-14 cable—descends 11,000 linear ft. to the community. During its course, this cable lies on the ground, exposed to the elements . . . is buried in conduit . . . and for 4900 ft. runs through the underground workings of the mine in conduit and on messenger. From the edge of town, 80,000 ft. of pole-strung Federal RG-11U cable, serving as secondary lead and drop cable, continues the transmission to some 500 TV receivers. Throughout these long cable runs, the superior mechanical characteristics, the constant impedance, low line loss, and low power factor of BAKELITE Vinyl Plastics and BAKELITE Polyethylene prove big factors in maintaining the TV signal at essentially the same quality as received at the antennas. The first amplifier necessary in the primary cable *is 2400 ft. from the front end equipment on the mountain peak.*

Wire and cable jacketing made of BAKELITE Vinyl Plastics is wax-smooth —for easier pulling and stripping. Compounds can be formulated to stay pliable in very low temperatures . . . resist deformation in extreme heat. Lasting colors provide permanent coding. BAKELITE Polyethylene is light, permits smaller diameters—for easier handling, savings in space and weight. Cores of this material stay tough and flexible . . . hold their excellent electrical properties through a wide temperature range.

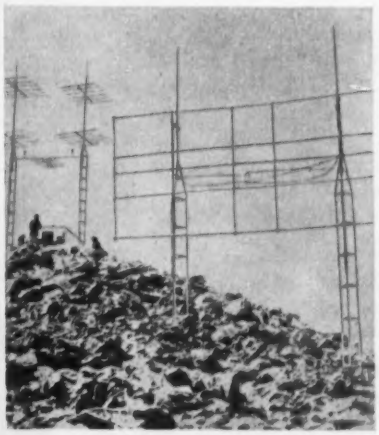
For all the facts on BAKELITE Vinyl Plastics and BAKELITE Polyethylene for wire coverings, and names of your nearest suppliers, write Dept. AC-63.

Data courtesy of: **Climax Molybdenum Co.**, Climax, Colorado; **Federal Telephone and Radio Company**, Clifton, N. J., a division of IT&T.



Taking antenna field strength readings atop 13,783 ft. Mt. McNamee.

Installation crew watching the first TV reception on test equipment in the amplifier shack. In normal operation, the insulated 6'x6' metal building houses the front end amplifier equipment for the community antenna system.



Two antenna groups receive channels 2, 4, 7, and 9 from Denver stations, about 60 air miles away. The first antennas suffered considerable damage from icing and high winds, and had to be replaced with sturdier structures. The coaxial cables however, insulated with BAKELITE Polyethylene and jacketed with BAKELITE Vinyl Plastic, measured up to expectations from the very first. Note the loose, broken rock, typical of the terrain along the course of the primary cable.

BAKELITE
TRADE-MARK
PLASTICS

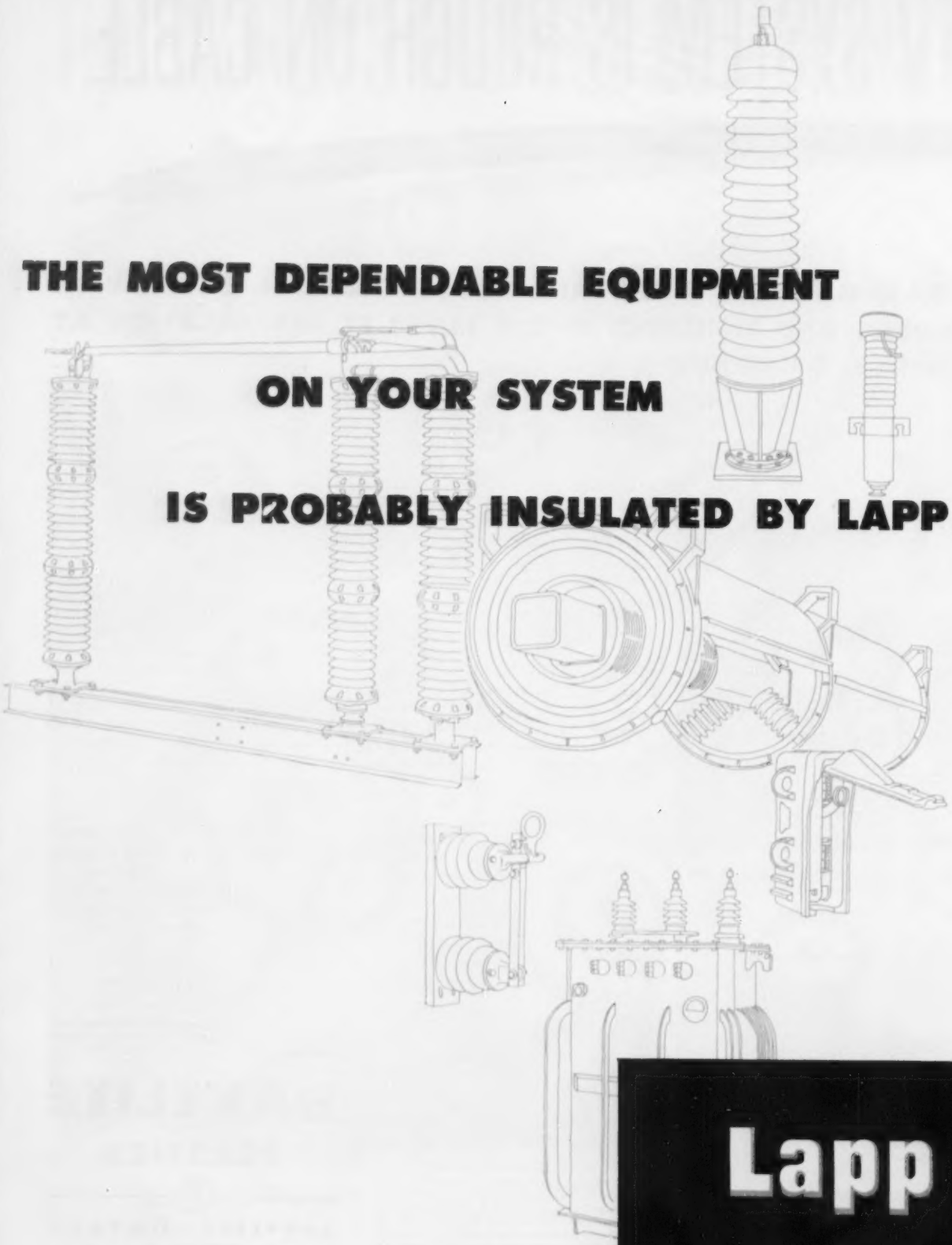
TRADE MARK

BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.

THE MOST DEPENDABLE EQUIPMENT

ON YOUR SYSTEM

IS PROBABLY INSULATED BY LAPP.....



Lapp

....HOW ABOUT YOUR TRANSMISSION LINES?

Manufacturers of the best in switches, transformers, lightning arresters, fuse boxes, and other high-voltage electrical equipment look to Lapp for insulators and "special porcelain" insulating components. That's because they know porcelain-and-metal assemblies produced by Lapp offer an extra margin of operating security . . . long life . . . and low upkeep. Lapp porcelain adds value, because it adds dependability, to such equipment.

The porcelain-and-metal assembly of which Lapp has made more units than any other, is the 10″ suspension disc. This "simple design" has had more research and testing than anything else we have ever worked on.

We know, as do hundreds of power companies, that there's no surer way to build security and long service into a transmission line than to hang it on Lapp suspension insulators.

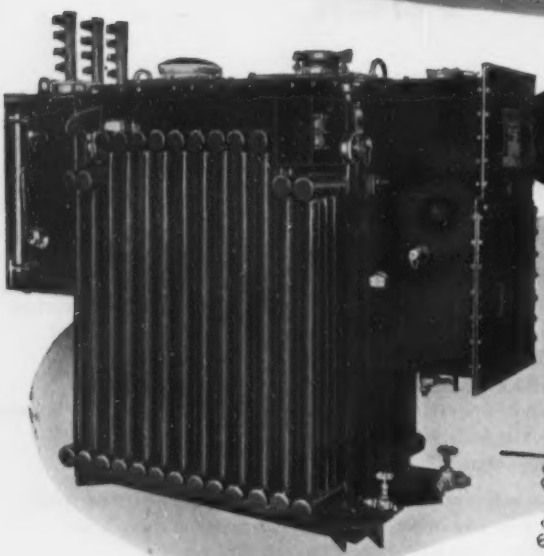
Lapp Insulator Co., Inc., Le Roy, N. Y.

Above THE GROUND

Type A distribution transformer, 75 KVA, 2400 to 120/240 volts, single phase, 60 cycles, with cover mounted high voltage bushings. Built for pole or crossarm mounting in full accordance with A.S.A. standards.

Standard

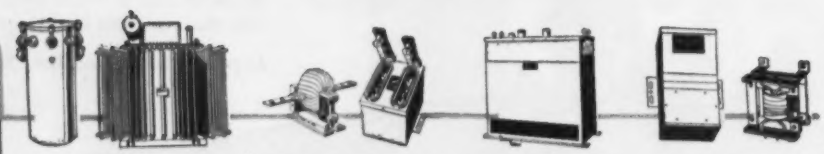
TRADE MARK



Under THE GROUND

Type HTS Askarel subway type network transformer, 500 KVA, 12,470 to 216Y/125 volts, 3 phase, 60 cycles, complete with high voltage disconnect and grounding switch, low voltage network protector, and electrical interlocks.

Transformers FOR EVERY APPLICATION

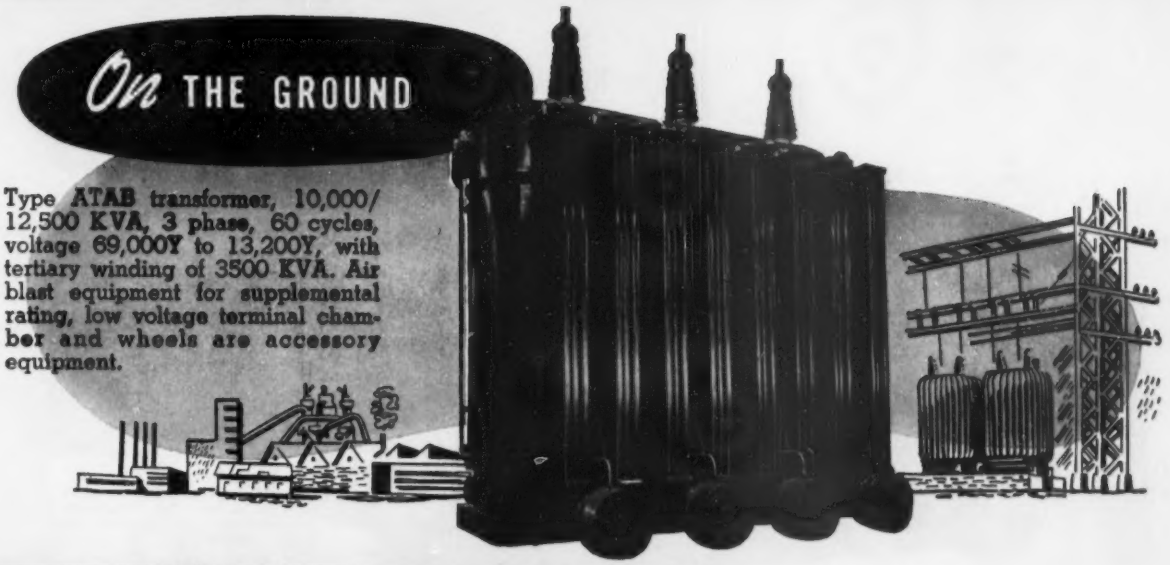


Liquid filled (sizes up to 10,000 KVA and 72 KV inc.)

Instrument transformers (for use on circuits up to 72,000 volts, inc.)

Dry type (up to 1000 KVA and max. voltage ratings of 4800.)

Control transformers (compound filled or open type.)


On THE GROUND
Type ATAB transformer, 10,000/12,500 KVA, 3 phase, 60 cycles, voltage 69,000Y to 13,200Y, with tertiary winding of 3500 KVA. Air blast equipment for supplemental rating, low voltage terminal chamber and wheels are accessory equipment.

TRANSFORMERS AT EVERY LEVEL

Installed on thousands of poles throughout the electrical distribution system. On the ground stepping-up or stepping-down at substations. Underground at network load centers. You find STANDARD transformers operating at every level because . . .

. . . users of electrical equipment, having learned through actual experience, place their confidence in the transformers that are built "right" from the ground up. Designed by topflight engineers, constructed by craftsmen who know the importance of following instructions to the letter, then . . .

. . . tested by STANDARD, a recognized leader in the manufacture of Testing transformers. Thus possible future trouble spots are located and eliminated before the transformer leaves the factory. Fully protected from the ravages of dust, dirt, fumes and dampness. Rugged construction allows STANDARD transformers to be used anywhere. Next time remember . . . STANDARD TRANSFORMERS.

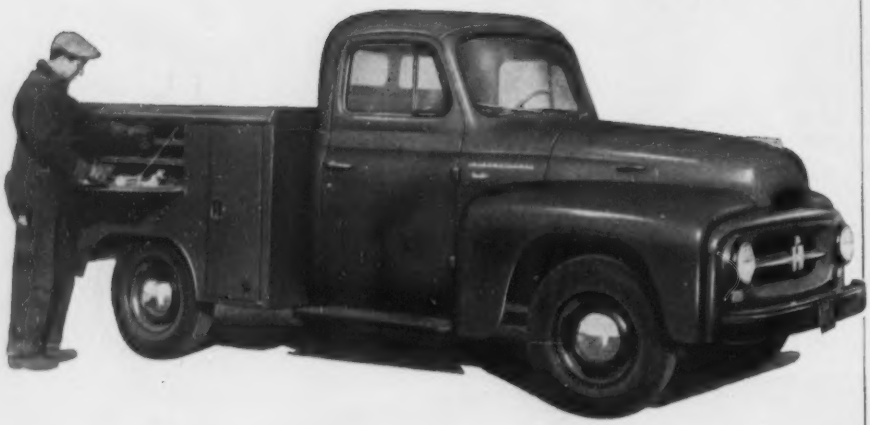
Standard

The Standard Transformer Co.

Warren, Ohio

Representatives in principal cities

NEW optional power steering for all models. New light-duty truck features include tubeless tires, standard—optional automatic transmission or overdrive. Service-Utility bodies that "take the workshop to the job"—available in three lengths, in nine light-duty models.



NEW MODELS NEW FEATURES

INTERNATIONAL keeps 'em coming... all the time, to do today's truck jobs better, at lower cost!

INTERNATIONAL continually brings you great new truck features, new all-truck models, new value for your truck dollars, in the world's most complete truck line. INTERNATIONAL follows this policy to give you right now the developments that will help you do your hauling jobs better, cut your costs and boost your profits. Before you make any truck purchase, check all the new developments shown here—then let your INTERNATIONAL Dealer or Branch give you *all* the reasons why an INTERNATIONAL is your best truck buy.

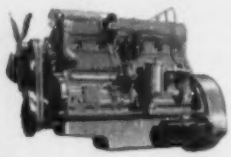
INTERNATIONAL HARVESTER COMPANY • CHICAGO

NEW multi-stop models with METRO® bodies—14,000 to 16,000 lbs. GVW. 10 other models—5,400 to 11,000 lbs. GVW with METRO and METROETTE bodies—available with new METRO-Matic transmission.

NEW space-saving, high economy, big capacity COE models—3 series, 12 models from 21,000 to 30,000 lbs. GVW—50,000 to 65,000 lbs. GCW. Also available with sleeper cab.

NEW Super Space Saver ROADLINER® conventional truck-tractors that haul all 35-foot trailers in 45-foot limit. GCW, 42,000 to 65,000 lbs.

NEW factory-installed 50-inch one-man cab that permits balanced, 2-side loading of steel, lumber, pipe and other longer-than-truck materials.



NEW increased power, with all-new 201-hp Royal Red Diamond 501 engine standard in new high-power-to-weight 220 Series models.

NEW RF-230 60,000 lbs. GVW six-wheeler, one of 25 six-wheel models—all with new maintenance-reducing, extra rugged rubber-bushed bogie.

PLUS four-wheel-drive models of 11,000 and 15,000 lbs. GVW—built for lowest cost operation in roughest, toughest terrain.

PLUS factory-installed, Underwriters' approved LPG power, available as optional equipment in 54 models from 4,200 to 45,000 lbs. GVW.

PLUS 10 diesel engines for 30 models. The INTERNATIONAL line of 185 basic models offers widest choice of power—30 engines, gasoline, LPG and diesel.

International Harvester Builds **McCORMICK®** Farm Equipment and **FARMALL®** Tractors...Motor Trucks...Industrial Power...Refrigerators and Freezers

See the season's new TV hit, "The Halls of Ivy," with the Ronald Colmans, Tuesdays, CBS-TV, 8:30 p.m., EST

INTERNATIONAL® TRUCKS

"Standard of the Highway"

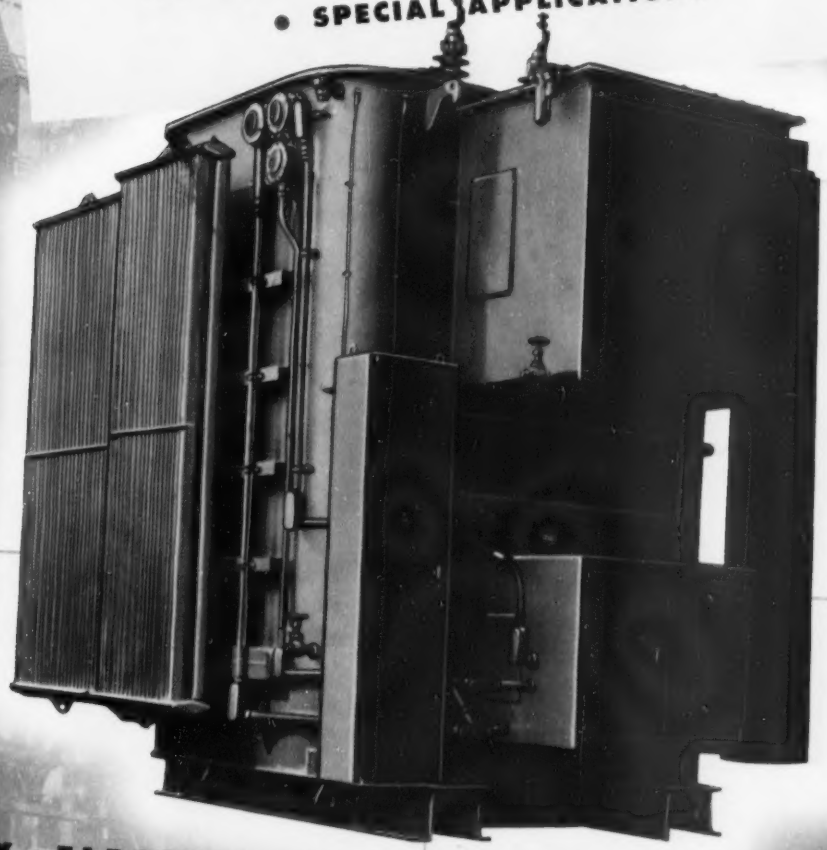
LTC 906-54

MOLONEY ELECTRIC

LOAD TAP CHANGING EQUIPMENT

as applied to:

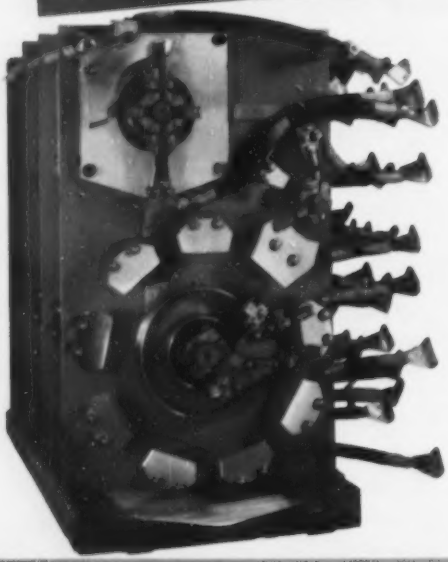
- STEP VOLTAGE REGULATORS
- LOAD TAP CHANGING TRANSFORMERS
- REGULATING TRANSFORMERS
- PHASE SHIFTING TRANSFORMERS
- SPECIAL APPLICATIONS



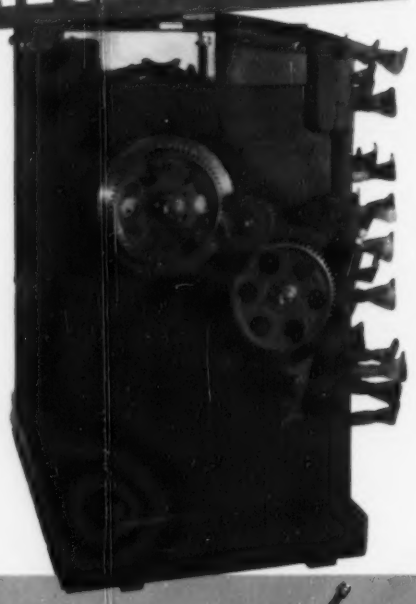
MOLONEY ELECTRIC COMPANY • ST. LOUIS 20, MO.

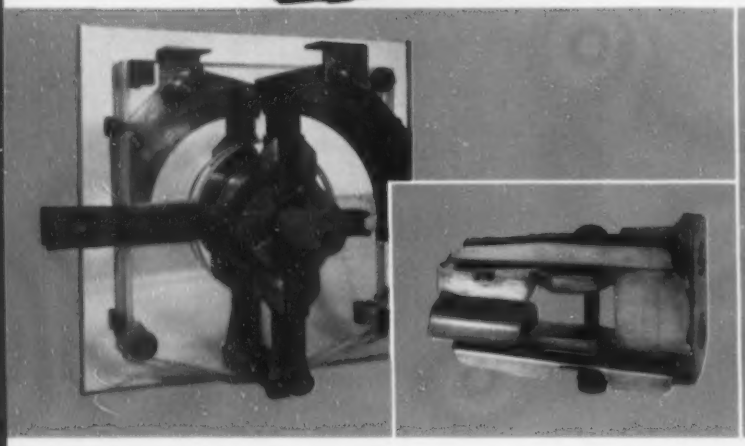
DEPENDA

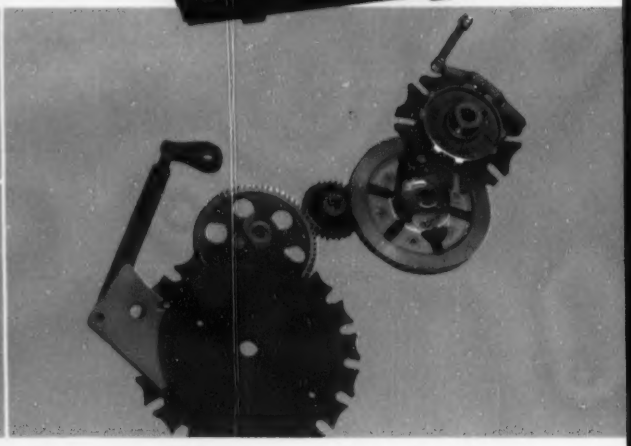
ELECTRICAL



MECHANICAL







- Moloney Load Tap Changing Equipment is designed to provide continuous full load operation at any point of its operating cycle.
- Mounted on a heavy bakelite panel with greater than normal electrical clearances, all electrical conductors have low current densities.
- Copper tungsten tips on the load transfer switch interrupt all current preventing deterioration of tap selector switch and reversing switch.
- Double moving contacts are spring loaded to provide optimum contact pressure. They have been designed of softer material than the stationary contacts to eliminate stationary contact wear.

- The Moloney Load Tap Changing Transmission Mechanism is solidly mounted on a heavy steel plate to provide large, stable bearing surfaces for all rotating shafts.
- Geneva gears throughout provide sharp incremental movement to all switches. Geneva gears plus multiple stress springs provide desirable "quick-make", "quick-break" features for the load transfer switch.
- Drive pins overide to insure direct constant coupling in the event of spring failure.
- Reversing switch can only be operated from tap selector switch when it is in the neutral position.
- Mechanical stops prevent dangerous overtravel of the entire load tap changing mechanism.

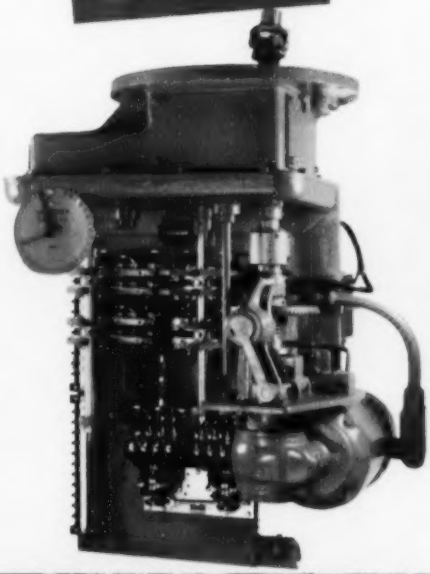
MOLONEY LOAD TAP

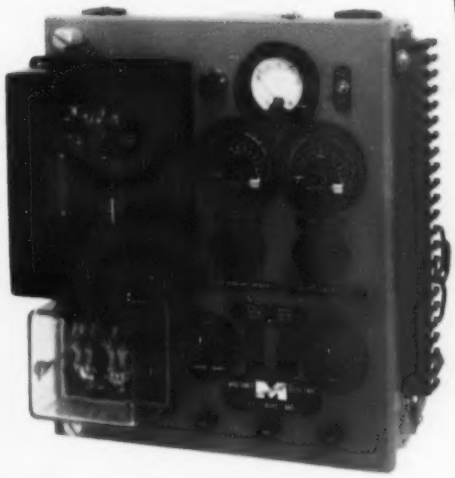
as applied to: STEP VOLTAGE REGULATORS • LOAD TAP CHANGING TRANSFORMERS • REGULATING

BILITY

DRIVE

CONTROL

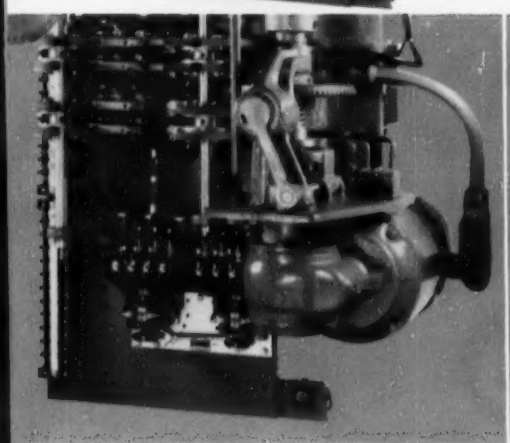


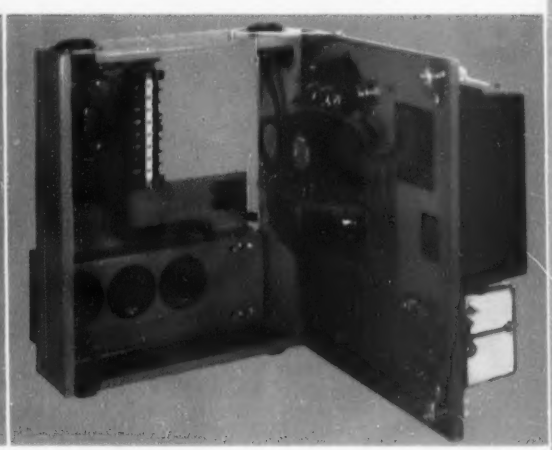


- MINIMIZED WEAR FROM FRICTION
- FULL CYCLING POSITIONS ELIMINATE REACTOR LOSS

INSPECTION and MAINTENANCE ACCESSIBILITY

- Removable inspection plates permit access to all switches.
- Hinged front cover permits easy access to entire mechanism.
- Hinged doors on control compartment.
- Control and drive front-wired throughout.
- Control equipment mounted on hinged panel.
- Ample work space.





- FULL CONTINUOUS CAPACITY ANY POSITION
- VERTICALLY MOUNTED INSULATING SURFACES
- SPRING ACCELERATION, POSITIVE-SNAP-ACTION ARC CONTACTS
- GREATER ARC CLEARANCES
- SPECIAL ARCING TIPS
- NO ARCING DUTY ON TAP SELECTOR SWITCH
- ARC GASES CONFINED TO SMALL SPACE

- The Moloney Load Tap Changing Drive Mechanism is powered by a sturdy drive motor through an oil-filled gear reduction unit.
- Mechanically interlocked motor starters prevent simultaneous closings.
- A spring loaded brake prevents overtravel of the entire drive.
- Drive motor is electrically and mechanically disconnected for hand crank operation. Hand crank operation cannot affect the positive mechanical coupling to all timing gears and cams.
- All exposed surfaces are protected by plating or painting to prevent corrosion and deterioration due to atmospheric conditions.

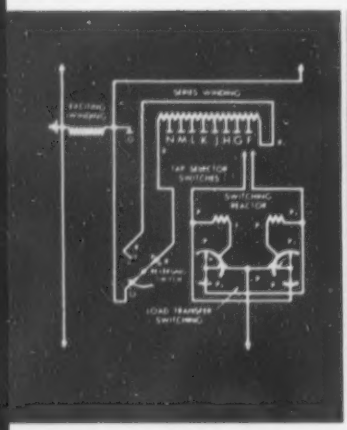
- The Moloney Load Tap Changing Mechanism Control is provided with an accurate voltage regulating relay. This contact-making voltmeter is sensitive to all variations of line voltage.
- Compounding coils are energized to prevent contact bounce and ultimate wear when contact is made.
- Accurate linear HiperCore wound core components are provided in the line drop compensator for simulating voltage at the desired load center.
- Sequence of control provides a continuous operation of the load tap changing mechanism once a step of tap change has been initiated.
- Thermal type circuit breakers provide protection for all control wiring against short circuit and overload conditions.
- The entire control panel is shock-mounted against all vibration.

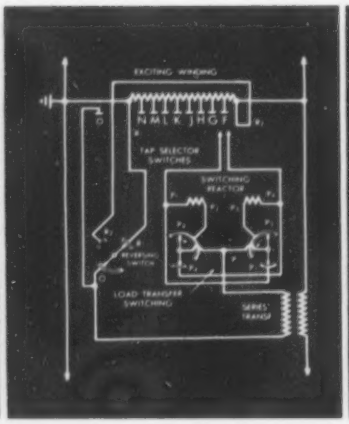
CHANGING EQUIPMENT

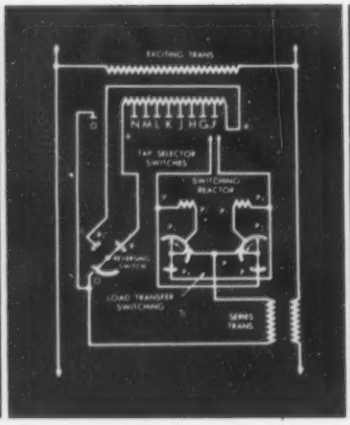
TRANSFORMERS • PHASE SHIFTING TRANSFORMERS • SPECIAL APPLICATIONS

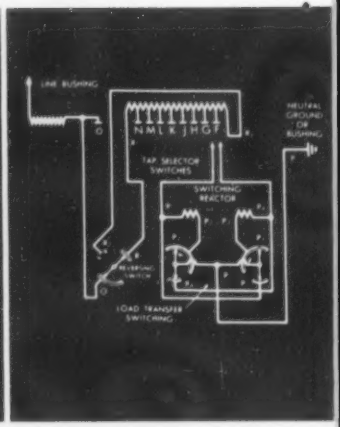
MOLONEY ELECTRIC

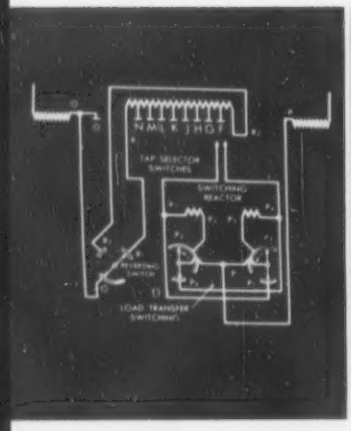
LOAD TAP CHANGING EQUIPMENT APPLICATIONS

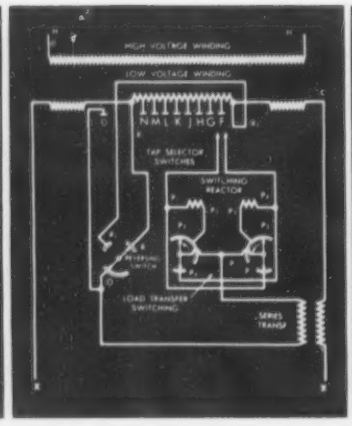


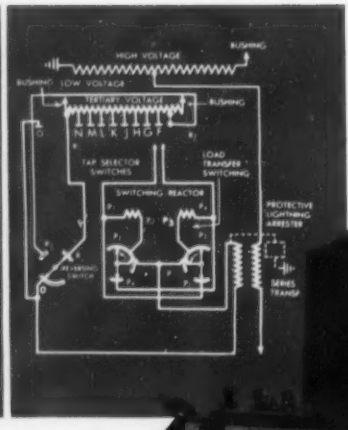


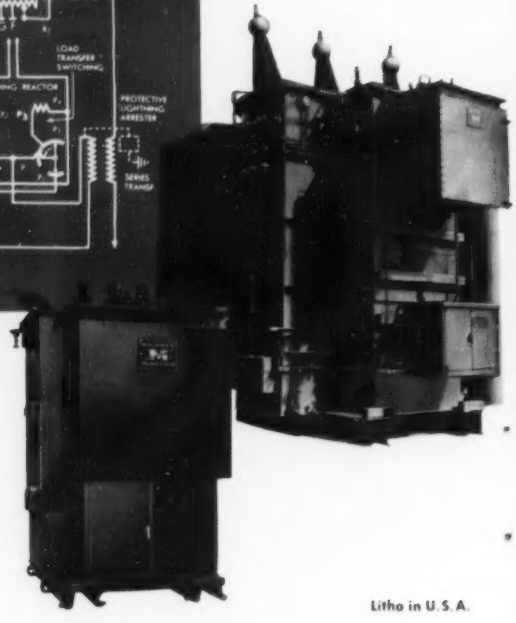












Moloney offers a complete line of regulating equipment in any Kva and voltage rating. Whatever your system requirements may be—great or small—Moloney Load Tap Changing Equipment is available to add efficiency and dependability to your service. The Moloney Load Tap Changer is a self contained mechanism highly flexible for adaptation to many special applications. Moloney Engineering Facilities are available for consultation and suggestions concerning special problems which arise from unusual operation or installation conditions.

Litho in U. S. A.

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Tap Changing Transformers • Load Center Transformers • Unit Substations Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MISSOURI AND TORONTO, ONTARIO, CANADA

For the Heat Pump Tomorrow Is Bright

It was just after the end of the war that the potentiality of the heat pump for heating and cooling residences and all the places where people live and work and play was discerned by more than a few farsighted leaders of thought in the electrical industry.

In terms of application the heat pump has not yet gone very far, only about 4,300 installations today. This is only an infinitesimal figure in comparison with the nearly 50 million customers of electric utilities who constitute the heat pump market. But in terms of product development the heat pump has gone far indeed. We must remember that it was not much more than a promising idea only eight or nine years ago. Today the heat pump is available as a package product, sold and bought with the same confident expectation of satisfactory performance as attends the purchase of an automobile, a refrigerator, or any other machine in common use.

As to price, the heat pump is still in the luxury class. But it will not remain there long. Production volume will increase, and bring economies in manufacture. Design improvements will continue, reducing the size of the machine, bettering its performance, and enhancing its buyer appeal. All this will come about as competent and enthusiastic sales effort enlarges the market. And again we will see, as we have many times before, today's luxury transformed into the commonplace living of tomorrow.

The heat pump is on its way, no doubt of that. How fast it will move towards its destined place in American life depends on many factors among which the attitude of electric utilities is very important. In the group of heat pump articles in this issue this aspect of the situation receives attention. Coldest and warmest day graphs of heat pump operation show characteristics of its load in various parts of the country. The wide variability of the characteristics, apparent from the graphs, says definitely that every residential heat pump installation is an individual, each with its own load characteristics depending on climate, nature of home occupancy, and the ideas of different people on comfortable temperatures. All other major uses of electricity in the home fall into quite definite load patterns which are about the same for all parts of the country—not so the heat pump. Apparently it has an inherent load diversity that is local as well as regional. This should be a real virtue in the eyes of the supplying utility.

Because it combines the functions of heating and cooling in one machine, the heat pump has found its first application in the South. Here the balance between heating and cooling comes closer to equality, and the inherent economy of the heat pump is more nearly realized than in northern areas. This makes the machine especially attractive to both user and power supplier, resulting in enthusiastic promotion and gratifying buyer acceptance. In other regions promotion has been spotty and potential buyers are generally unacquainted with it. But the heat pump is moving north and eventully will find application all over the country as its values to user and utility become more widely known.

A Good Fight Can Win Battles That Appear Lost

Voters in Union County, Ore., voted nearly 2 to 1 in the recent election to dissolve a public utility district which had been created to acquire privately owned electric facilities in the area. The tally on this issue was 2,641 to 1,340.

Earlier this PUD had failed to win approval of a $4.5-million bond issue. The outcome of both these votes is a tribute to the efforts of California-Pacific Utilities Co which fought the grab of its plant every step of the way.

Whether the defeat of the PUD is the beginning of a trend in the Pacific Northwest remains to be seen. Nevertheless, the aggressive and victorious efforts of California Pacific should be a tonic to the industry. The PUD controversy was a clear-cut case of "getting the facts to the people." A review of the case presents dramatic highlights that would rival a fiction story.

Throughout the pre-election period, the company met and countered the PUD proponents' promise of rate reduction, better service, new industries, and a publicly owned utility as a community asset. Through its employees and advertising, it maintained and increased the public's confidence. The final score was tallied when the bond issue was defeated by a vote of 2,823 to 2,229—a larger margin than in the first election.

Certainly other companies can take heart from the success of California Pacific Utilities. Defeat should not be conceded before the battle has been joined. A factual fight can win.

Gotta Snuggle Up

To whom does the farmer turn when he has an electrical problem?

Not very often to the power supplier, according to a survey recently conducted by the U. S. Department of Agriculture among farmers of New York and the New England states. Replies from 1,061 farmers say he goes to the local electrical contractor or pliers-and-screwdriver electrician most often—85.3% of the cases. He thinks of the power supplier as a source of help or information very infrequently—4.5%.

It is as it should be that the farmer turns most often to the local contractor or electrician. Most of his electrical problems are of such a nature as logically to be handled by them. But the fact that the farmer calls on the power supplier less than once in 20 times of electrical trouble or of need for electrical information rather deflates the pet idea of the supplier that he is the farmer's guide, philosopher, and friend in electrical matters.

If the recently organized Inter-Industry Farm Electrification Council is to achieve any measurable success in building up the usage of electricity on American farms, then the power supplier will have to snuggle up a lot closer to the farmer than is indicated by the 4.5% figure reported by the U. S. D. A. survey. You can't do much business with a man you don't know and who doesn't know you.

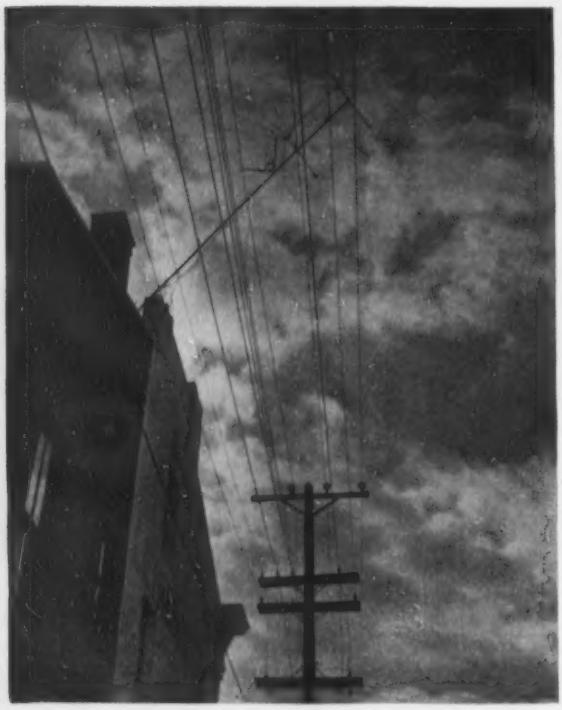
Could it Be?

Democrat Richard L. Neuberger is going to the Senate next year because he polled 2,166 more votes than Senator Guy Cordon. The thin majority in this election amounted to a mere ⅓ of 1% of the votes cast in the Oregon election.

Now it may be true, as a previous survey indicated, that the federal power policy issue played only a minute role in the Oregon vote. But if the issue switched just 1,084 of the Oregon voters to the Neuberger column, it was just enough to unseat the outstanding proponent of Republican power policy in the Senate.

Could it be, then, that the federal power issue really:

- Deprived the Senate of its most able proponent of GOP power policy?
- Put Oregon Independent Senator Wayne Morse in the driver's seat so far as Senate organization is concerned?
- And therefore shifted control of the Senate from the Republicans to the Democrats?



TV Antenna—Menace in Action

The fallen antenna pictured above was only one of thousands that toppled when shoved by Hazel, the hurricane. To all distribution men this picture should serve as a reminder to check the locations of all antennas in their areas and to have those improperly located moved to a safer location before the next hurricane arrives.

THE ELECTRICAL WEEK

The Issue's News Highlights . . . Democratic control of Congress puts legislators sympathetic to public power in key committee posts. Local voting offers no clues to public's attitude on power.

Democratic Sen Clinton P. Anderson spearheads attack on Dixon-Yates contract at Joint Congressional Atomic Energy Committee hearing.

Territory accord between Arizona Public Service and Salt River Power District is agreed upon to end expansion conflicts.

Nema Elects: A. F. Metz, chairman of Okonite Co, president succeeding J. H. Jewell, vice president of Westinghouse Electric Corp. Elected vice presidents are B. C. Neece, president, Landers Frary & Clark; Fred F. Loock, president, Allen-Bradley Co; W. V. O'Brien, vice president and general manager, Apparatus Sales Division, General Electric Co; J. J. Mullen, Jr, president, Moloney Electric Co; and W. A. Elliott, president, Elliott Co. A. A. Berard, president, Ward Leonard Electric Co, is elected treasurer.

Nema awards Robert S. Fleshiem, assistant to the vice president of Allis-Chalmers Manufacturing Co, the coveted Fifty Year Award for a half century of service to the electrical industry. Except for 18 months out for military service in World War I, Fleshiem has spent all that time with A-C.

Nema aids rural-power sales drive by authorizing its Farm and Rural Market Development Committee to participate in activities with utilities, with REA cooperating to promote increased electrical load in rural areas . . . Nema increases 1955 budget to $1,172,294 from $1,154,723 in 1954. Largest single increase is $25,000 for Adequate Wiring Bureau which will get $157,835.

NARUC meeting highlights . . . NARUC Pres C. L. Doherty told members in Chicago last week that "utility services in the American economy can be sufficient only under wise regulation of free enterprise, and only under wise regulation can enterprise remain free." . . . Spencer B. Eddy, New York PSC Commissioner, said it was responsibility of commissioners to continue "the American tradition of sound and effective regulation, of balancing the interests of individual who is the consumer and the individual who is the investor." . . . On the question of proper depreciation base, NARUC Committee on Depreciation reported that "the claims advanced in support of 'economic depreciation' are lacking in probative force."

Atomic Industrial Forum, Inc contracts for series of twelve 30-minute films on peacetime applications of atomic energy. Subjects will range from uranium mining to reactor design and use.

Off the Washington Wire . . . Sen James Murray (D-Mont.), slated to be new chairman of Interior Committee, says he and Sen Wayne Morse (Ind-Ore.) are working on legislation to block private development of Hells Canyon power site on Snake River. He promises more hearings with Interior Secretary Douglas McKay as witness. Meanwhile, FPC Examiner William Costello grants two-week delay to Nov. 24 for filing briefs on the case.

REA decides to make its farm-use organization, the Inter-Industry Farm Electric Utilization Council, a permanent group with a continuing program. Industry interest at five area meetings sparked the idea, and members hope new statewide groups trying to boost farm use of electricity will push the program at a local level.

Post election view: Senate Democratic Leader Lyndon B. Johnson promises a huge development program for natural resources, including large reclamation and conservation projects in the West . . . Compulsory licensing of atomic patents stands a better chance of being prolonged from five to 15 years, rather than being eliminated.

Georgia Supreme Court rules that Georgia PSC has no legal authority to force Georgia Power Co to buy or merge with Georgia Power & Light Co or to sell power to the latter. Action reverses Fulton Superior Court in sustaining demurrer of PSC.

TVA is attempting to insert a clause in its purchasing contract requiring contingent liability for failure of equipment . . . Sixth unit of TVA's Shawnee steam plant has gone into operation, boosting TVA system capacity to 6,619,185 kw, of which steam represents 3,137,250 kw.

Duquesne Light Co's request for rate increase takes on new life as Pennsylvania Supreme Court sets aside a petition by City of Pittsburgh which would have side-tracked company's request.

Central Illinois Light Co files with Illinois Commerce Commission for $1.6 million (before taxes) annual electric rate increase.

Electric power output week ended Nov. 6 reached new high of 9,357 million kwhr, 11.4% above 1953.

Puget Sound Utilities Council would consider building a third powerhouse at Grand Coulee and adding two generators at Chief Joseph Dam to utilize increased water flow from proposed Mica Creek Dam in Canada, according to council's consulting engineer.

Seattle City Council upholds contention of City Light officials that Port of Seattle should not be permitted to sell electric power to its tenants.

Congress Gets Public Power Bent

- **Democratic victory at polls means legislators more sympathetic to public power will head key committees; Dixon-Yates issue could be kept alive**
- **Local voting shows no clear trend toward public or private power**

The election brought to power and influence Democrats in both the House and the Senate, many of whom have a different slant on the power issue than their Republican counterparts. Hence, the Democratic control of Congress — with Democrats holding down committee chairmanships—means new pressures will be brought on many phases of power policy pursued by the Eisenhower Administration for the past two years.

The turnabout is revealed most sharply in the Dixon-Yates controversy. One of the leading attackers of the contract is Sen Clinton P. Anderson of New Mexico who will become chairman of the Joint Atomic Energy Committee when the Democrats organize the Senate in January. And already Congressman Chet Holifield, Democrat of California, has promised to introduce a bill to void the contract by law.

Whether or not the situation actually comes to this pass, there's no doubt that the Democrats taking charge of a Dixon-Yates investigation next January, could keep the controversy on the front pages for weeks and months in a way that could not have happened had the Republicans been given majorities in the two houses.

Public Power Favored . . . The Democratic leadership, particularly that of Speaker Sam Rayburn of Texas, leans strongly on the side of public power, and the wins and losses where power was a real issue in the campaigns certainly fortifies this general Democratic bent.

Most dramatic win was that of Democrat Richard Neuberger in Oregon who attacked Republican Sen Guy Cordon squarely on the power issue–fighting the partnership policy as a bad thing, and attacking other Eisenhower policies as give-aways. Neuberger came out firmly for a federal high dam at Hells Canyon. Cordon's defeat is a severe blow, since he was the leader in the Congress for putting across most of the proposals of his fellow-Oregonian, Secretary of Interior Douglas McKay; and Cordon is the first Republican candidate for Senate to be defeated in 40 years (for further information on Neuberger, see p 113).

Another GOP loss where power issues counted was that of Kentucky Sen John Sherman Cooper. Cooper opposed the Dixon-Yates contract, as did his opponent, Veep Alben Barkley; but Cooper lost votes by being the candidate of the President who called TVA "creeping socialism" in an area where TVA has a hold on the voters.

Future Power Sites . . . Right now it's hard to say just what will happen to the so-called "partnership policy" of developing power sites by getting local interests to share part of the costs. Priest Rapids and Cougar won't be repealed but there will undoubtedly be a vast increase in the strength of those favoring federal development outright.

Another victor at the polls is Mrs Gracie Pfost, of the First District of Idaho, who two years ago defeated a Republican when she came out for federal dam at Hells Canyon.

In the Senate, Senator James E. Murray of Montana who also won over a Republican this year, becomes chairman of the Interior and Insular Affairs Committee, which must pass on most of the important legislation affecting federal power policies. Judiciary Chairman Republican William Langer of North Dakota will be succeeded by Democrat Harley Kilgore of West Virginia, who is also a long-time public power advocate.

On appropriations, Sen Carl Hayden of Arizona succeeds Styles Bridges of New Hampshire as chairman of the money-voting committee. Senator Cordon was chairman of the Interior subcommittee; Senator Hayden may choose this subcommittee but this may not be known for sure until some time later.

On the House side, as Electrical World reported last week, the Democratic majority puts pro-public power legislators in key positions, too.

Other Issues . . . On the local level throughout the country, a number of lesser issues were resolved by the voters with no clear trend discernible one way or another.

While all eyes in Oregon were on the Neuberger-Cordon contest, these other issues were settled:

The Multnomah voters turned from GOP-nominee Tom McCall, a former McKay aide, to back Mrs Edith Green, Democrat, who has declared she stands for the policies that brought Grand Coulee and Bonneville.

Democrat Albert Ullman, active in Oregon groups favoring a federal dam in Snake Canyon, lost to incumbent GOP Rep Sam Coon who said he would go along with FPC decision on Hells Canyon.

In Southern Oregon's Fourth District, Democrat Charles O. Porter made federal power policy an issue. But he lost heavily to Republican Harris Ellsworth.

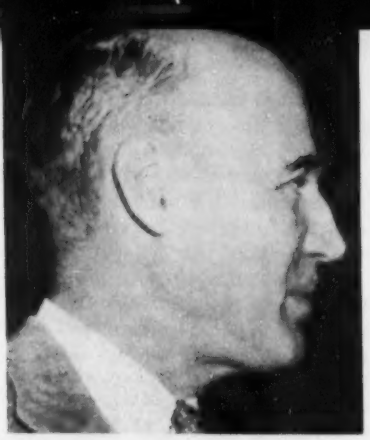
Oregon voters gave the brushoff to

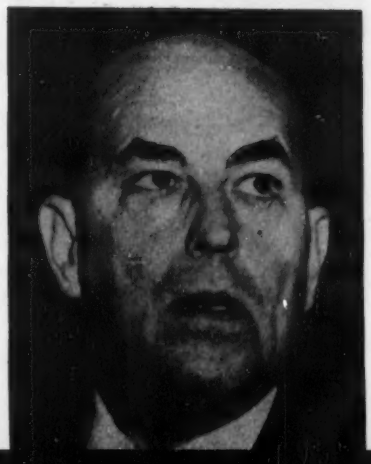
(*Continued on page* 108)

N. J. Gets an 'Edison'

Raritan Township last election day voted to become the first locality in the State of New Jersey to assume the name of "Edison." Raritan officially changed its name to honor the "Wizard of Menlo Park." The park is a section of the town where the inventor perfected many of his inventions.

The voters, who had to choose between Edison or Nixon (which would honor a prominent local citizen) voted this way: For Edison, 3,273; against, 3,075. For Nixon, 3,060; against, 3,557.





Anderson Leads Attack at Dixon-Yates Hearing

A preview of what the Democrats are going to do to try to frustrate President Eisenhower's plan to halt federal expansion in the Tennessee Valley was given last week as the Joint Atomic Energy Committee reopened hearings on the controversial Dixon-Yates contract.

Sen Clinton P. Anderson (D-N.M.), who becomes chairman of the Joint Committee in January, grilled the contract's proponents for hours on end. Then the Democrats on the committee moved to kill the contract by a call for a showdown vote on approval. But they lost, 10-8, on a straight party-line vote.

Changes Agreed Upon

The Democrats did succeed, however, in getting Atomic Energy Commission and the Dixon-Yates group (Middle South Utilities and Southern Co) to back down on major provisions of the contract and auxiliary agreement. These changes include:

1. Giving the government recapture rights to the plant during the first two years of the contract.

2. A guarantee from Dixon-Yates group that it will supply AEC with an additional 100,000 kw if the second generator takes longer than 34 months to go on the line.

3. Removal of Ebasco Services, Inc, as a constructor, but leaving open the possibility that Ebasco may be used as engineer or designer.

4. Granting the government the right of extension of the 25-year contract to 45 years rather than 35 years as originally provided.

President Eisenhower told his news conference, meanwhile, that he had been assured the government was protected under the contract and that it was the best proposal offered to avoid a power shorage in he TVA area. He said if politics had been injected into the matter, he hadn't done it.

As Electrical World went to press, signing of the contract by Atomic Energy Commission and the Dixon-Yates group had been ordered by the Joint Committee, and what appeared to be mere details in accompanying legal opinions were the only obstacles to actually affixing signatures. But, signing does not mean the contract is sealed and delivered.

The Democratic victory at the polls raised some serious doubts as to the finality of the signing. Except for the change in the make-up of Congress, smooth sailing for the contract had been anticipated, but now that is altered.

Last week's hearings were called to consider a request by AEC that a requirement of the new Atomic Energy Law be waived to permit construction of the proposed steam plant to get underway before the Mississippi River reaches the spring flood stage. That provision of the act requires that such a contract lay before the Joint Committee for 30 days while Congress is in session.

The hearings were colorful, surprisingly so in view of the fact the elections were past. Chairman W. Sterling Cole (R-N.Y.) tried to keep them orderly, permitting each witness to present a formal statement before being cross-examined. He succeeded in the main, but even he became embroiled in disagreements with Anderson.

Possible Action by Congress

Their main disagreement followed questioning of AEC Chairman Lewis Strauss and AEC General Manager K. D. Nichols. Committee member Chet Holifield (D-Cal.) had asked Nichols if he thought the contract would be valid if Congress passed a law revoking AEC's legislative authority to make such arrangements. Nichols pointed out that any such law would require the signature of the President, and indicated that a veto was likely.

Anderson and Holifield took sharp

ADVOCATES of Dixon-Yates contract (top to bottom) K. D. Nichols, AEC general manager; Lewis Strauss, AEC chairman; Rowland Hughes, Budget Director; Herbert Vogel, TVA head

issue with this, declaring that "Congress has many ways of taking action" to by-pass an anticipated Presidential veto. Anderson pointed out that prohibitive appropriations riders have worked before, and Holifield cited concurrent resolutions, which do not require Presidential signatures, as potent directives from Congress to executive agencies.

To these threats, Nichols replied: "In these events, we'd have to cancel. But we'd still be subject to the cancellation clause of the contract."

Cole declared the President would have to acquiesce to legislation to keep the contract from going into effect.

Anderson attacked the absence of many safeguards for the government. He compared it with the Electric Energy, Inc, and Ohio Valley Electric Corp contracts, and said they gave the government a better break.

Clash on Power Cost

Anderson and Nichols clashed over cost of Dixon-Yates power to the government. Anderson called on a memorandum from the General Accounting Office to show that the cheaper Mississippi Valley Generating Co built its plant, the more the government would pay in basic capacity charges.

He said the GAO had informed him that, if the Dixon-Yates plant cost $104 million, annual capacity charge to AEC would be $9,052,000, whereas if the plant cost only $94 million, the annual capacity charge would rise to $9,074,000, or $22,000 higher. Nichols indicated this was to encourage the company to do the best job possible, and stated that the net cost to the government would be less because of the return through payment of taxes.

Anderson held that the contract provided no guaranteed date for completion of the plant, or for delivery of power. Nichols answered the company would get no return on its borrowed capital until the plant was finished and delivery instituted. This would provide the needed incentive, he said.

Anderson asked whether a penalty clause had been considered. Nichols said the question of enforcing these has long plagued the Army Corps of Engineers. Besides, he said, such clauses raise the price of power.

Budget Director Rowland Hughes caught the worst of Anderson's grueling questioning. In his prepared statement, Hughes expressed unqualified endorsement of the contract, and urged its immediate approval. Anderson launched into Hughes this way:

Anderson: "Is there any provision in the contract to prevent the forming companies from avoiding putting up any risk capital by agreeing with their systems (Middle South Utilities' subsidiaries and Southern Co) to build the new plant on a cost-plus-10% contract, then taking the 10% and paying corporate income taxes on it and having about $5 million left over for equity capital?"

Hughes: "I haven't seen it, but I'm convinced they (Mississippi Valley Generating Co) would put it up."

Anderson: "Is there anything in the contract to prevent them from getting 10% from their firms to finance the investment?"

Hughes: "That's not in there—but I can't be expected to examine all the words of such a contract."

Anderson chastised Hughes on several occasions for not being familiar with the contract's provisions.

AEC Commissioner Thomas Murray explained his opposition to the contract. In his prepared text, Murray told the group:

- He would not vote for the contract so long as Ebasco Services, Inc, was slated to be the engineers and constructors for the new plant, or until he is convinced Ebasco's performance will be "competent."
- That he would insist that Mississippi Valley Generating Co's contracts relating to design, engineering, and construction be submitted for AEC approval before they are executed.

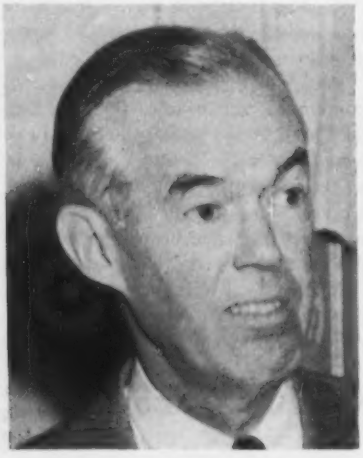
Vogel Urges Speed

TVA board chairman Herbert D. Vogel told the committee the contract should be signed and implemented this fall, before the Mississippi flood season sets in and sets construction back until late spring. He said that, while no wheeling agreement has yet been reached between AEC and TVA, he expects this to be ironed out soon. In this, he apparently disagreed with his fellow TVA directors, Harry Curtis and Raymond Paty.

Tennessee Gov, Frank Clement disparaged Vogel's qualifications as TVA chairman. He said Vogel "doesn't know what is good for TVA," and that he does not have the support of the other two TVA directors.

Alex Radin, general manager of the American Public Power Association, also took the stand to attack the contract. He called it the "opening wedge in the crippling of the TVA."

CRITICS of Dixon-Yates proposal (left to right) Sen Clinton P. Anderson, (D-N.M.); Thomas Murray, AEC commissioner; Sen Albert Gore (D-Tenn.) new member of Joint Atomic Committee who replaces Edwin Johnson, governor-elect of Colorado



Joseph Campbell of AEC Named Controller General

The complicated Dixon-Yates situation got another spin last week when President Eisenhower appointed Atomic Energy Commissioner Joseph Campbell to $17,500-per-year, 15-year term as Controller General of the United States.

Campbell, a Republican who has been on the AEC for about a year, has been the only commissioner standing firmly with Chairman Lewis Strauss on all particulars of the Dixon-Yates controversy—and on other AEC matters.

There's the question of whether Campbell will be approved by the Democratically controlled Senate. Sen Estes Kefauver and others say they want to look into Campbell's record thoroughly.

Territory Pact . . .

. . . between Arizona PS and Salt River Power District to end conflicts over expansion

An agreement on territories to be served has been reached by the Salt River Project Agricultural Improvement & Power District and Arizona Public Service Co.

For all practical purposes, the agreement maintains the status quo. But it will serve to end many conflicts which have arisen during the recent years of expansion.

The pact brings up to date a 50-year agreement drawn by both companies in 1928. Although the agreement has worked well through the years, the drafters of the pact, however, could not have anticipated the tremendous growth that has taken place in the valley during the last ten years and resulting differences of opinion over interpretation of the agreement.

Most of the City of Phoenix is served by Arizona PS with Salt River Power District operating in the surrounding valley and in some districts recently annexed by the city.

Agrees to Buy 50,000 Kw . . . According to the new agreement, Arizona PS will make all retail sales in four surrounding districts, but agrees to purchase power from the Power District for these areas. Also, in 1957, Public Service agrees to begin buying an initial block of 50,000 kw of electric power for use within valley cities and towns with the right to increase the amount of power purchased later on.

The Power District will continue to provide all power required for mining, milling, and associated operations, but will sell to Arizona Public Service the power the company needs for other purposes in this territory.

The district agrees it will not serve outside its designated territories. The private company agrees it will not serve inside the district's territories, except for towns and cities in the valley and for resale in Gila County territory.

Accord to Aid Expansion . . . Committees of the companies made a joint statement observing that "the new agreement is in the best interests of all, particularly the consumer. It will provide for orderly and economical expansion of the power systems to meet the customer's ever-growing needs and it makes possible, through economies resulting from the coordination in development and operation of the two power systems important benefits which should provide a definite assist in holding the line against the rising prices of maintaining first-class electric service to customers in the valley."

The joint statement continues:

"Because of the intermingling of service areas, even in the new agreement, the present competitive nature of the district's and the company's rates will not be destroyed and the relative minor shifting of customers from one system to the other should have little effect on the individual customers. The agreement does not contemplate a change of personnel of the two organizations."

Pelton Dispute

Supreme Court will rule on validity of license granted PGE for hydro project on Deschutes

The Supreme Court will decide the dispute between Federal Power Commission and Oregon over licensing of a $22-million hydroelectric project on the Deschutes River. The court will decide whether permits from Oregon state agencies are necessary before FPC can grant a power project license.

FPC issued a license to Portland General Electric Co for construction and operation of the project, which includes Pelton Dam and power plant to be built on government-owned land and a re-regulating dam on private property some distance below the dam.

Jurisdictional Question . . . State wildlife organizations joined Oregon's attorney general in challenging FPC's jurisdiction to issue the license. Last February, the Ninth Circuit Court of Appeals held that federal ownership of the power dam site does not empower the U. S. government to the use of the waters contrary to Oregon state law. FPC's license was set aside.

The legal issue involved centers around interpretation of the Desert Land Act of 1877. The Ninth Circuit Court says the act surrendered to the states regulatory power over nonnavigable waters on arid or semi-arid lands within the public domain. Oregon state officials opposed licensing the Portland General Electric project on grounds the dam would halt the

ascent of fish and create a hazard to fish.

FPC's Position . . . The FPC brief filed with the Supreme Court asking review of the lower court's decision, argues the 1877 statute does not permit the states to exercise their police powers to block projects approved by the appropriate federal agency. FPC also points out that the power company has offered to install special facilities to aid spawning fish and to enlarge existing hatcheries.

FPC makes a further argument that the Desert Land Act does not apply to the project on the Deschutes River, since the area around the project site has been reserved for power purposes.

In accepting FPC's appeal this week, the Supreme Court turned down a request by the Portland General Electric to intervene in the case. Arguments before the court probably will be held in January or February.

B. C. Opposes Ottawa on Arrow Lakes Dam

Long-range sniping by Canada's federal government at Kaiser Aluminum Co has finally brought retaliatory fire from British Columbia government that it might itself build the storage dam on Arrow Lakes, backed by Kaiser, if Ottawa tries to block the company's present plan.

(Kaiser plans to build $25-million low-level dam at Castlegar, in order to increase storage for downstream generation on U. S. side. Provincial government has given conditional approval to it, whereby province will get back 20% of the power generated. Ottawa objects because it considers B. C. government undercutting Canadian industry by providing power to U. S. interests at insufficient return.)

Now that the skirmishing has flared into open political combat, provincial authorities state B. C. could build the dam itself and new legislation requiring Kaiser to obtain a federal license would not then apply.

Lands and Forests Minister R. E. Sommers indicated the B. C. government might build the dam with Kaiser money after revealing Federal Trade and Commerce Minister C. D. Howe had written the company warning that the federal government intended to amend Fluid and Electricity Exportation Act to "cover export of regulated water by licensing permits."

Co-ops Team Up with Utilities

Private companies and REA's plan new cooperative projects as they demonstrate mutual benefits of working together

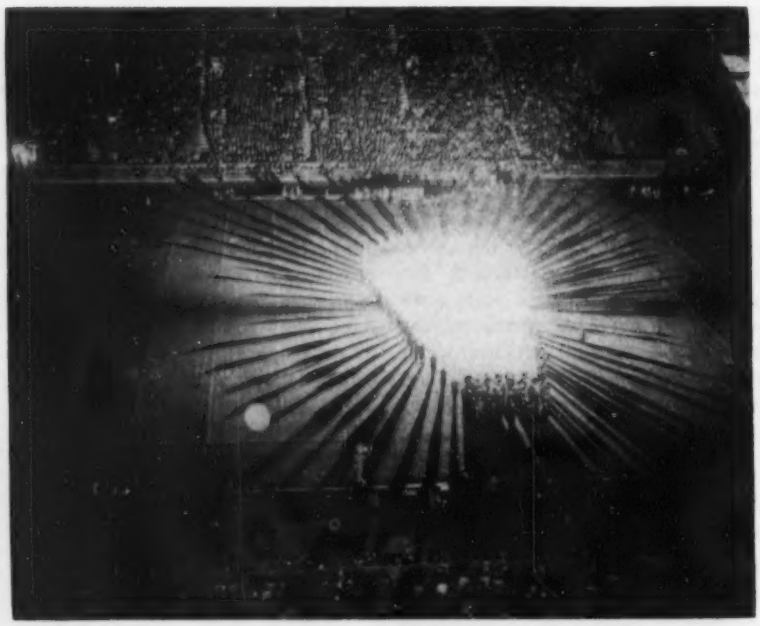
The Eisenhower "partnership" power policy made election news two weeks ago out West—but the government, under Democrats and Republicans alike, has been using its money to promote exactly such arrangements through rural electric co-ops for the past eight years.

The idea of a rural electric cooperative putting REA loan money into a generating plant, then getting together with an experienced private power utility to operate the plant and supply the co-op with cheap power, dates back to 1946, when Central Iowa Power Cooperative borrowed REA funds for a plant to be operated by the Central Iowa Light & Power Co.

The co-op was not only satisfied with the way the deal worked out—it borrowed more money in 1949 for additional G&T facilities, all for power company operation — it is proud of it. I. E. Trotnow, manager of the eight-member super co-op, declared recently the arrangement was "most satisfactory and successful."

More Schemes Planned . . . Similar deals have gone forward with such promising results that many others are already in the works and additional plans are being talked over more and more frequently.

In the Dakotas area for instance, the Dakotas Electric Cooperative, at Edgeley, N. D., obtained a loan in March, 1949, to provide facilities to bolster the power supply of Montana-Dakota Utilities Co. The plant, at Beulah, is operated by the company,



75-Kw Salute for LDJ at Football Show

The industry's 75th birthday was hailed in Dixie when Louisiana State University's Tiger Band presented a spectacular Light's Diamond Jubilee halftime show at the LSU-Florida University football game in Baton Rouge Oct. 23. The show, whose theme was history of man's quest for light, was topped off by illumination of 75,000 watt electric light pictured above. Band members, who outlined the shape of the light, gave a musical salute to the industry's birthday when they played "Happy Birthday."

which wheels power for the Bureau of Reclamation. The utility eventually will own the generating plant.

In eastern North Dakota and western Minnesota, two REA-financed co-ops and two electric power companies linked their G&T systems together. Minnkota Power Cooperative, Central Power Electric Cooperative, Otter Tail Power Co, and Northern States Power Co joined their facilities with those of the Bureau of Reclamation and municipalities to distribute power better among all customers.

In this case, it was a problem of how to meet increasing demand for power during the period before Garrison Dam comes into operation in 1955 or 1956. The power companies faced the loss of preference customers, and the co-ops looked for ways to cut costs pending delivery of their low-cost supply. The interconnection of facilities reduced operations of high cost diesel plants and provided back-up power for all participants in the deal. The bureau has an option to buy the REA-financed steam plant built under the arrangement at Voltaire, near Minot, N. D.

Loans Sought . . . Three other co-ops have already received loans, at least two others have made firm applications for loans to finance such ventures, and at least two others are in the talking stage, with applications presumed to be not too far in the picture.

• Rushmore G&T Electric Cooperative, Newell, S. D., got a loan in December, 1950. Black Hills Power & Light Co built and operates the plant at Osage, Wyo. Company rents the plant and guarantees the co-op certain capacity. Power goes over Black Hills and Rapid City-Midland bureau lines. Co-op retains title to the power plant.

• East Kentucky Rural Electric Cooperative and Kentucky Utilities Co have REA-approved agreement under which the co-op can save $3 million through reduction of 292 miles of high voltage lines and planned generating facilities.

• Corn Belt Power Cooperative at Humboldt, Iowa, obtained approval of an REA loan of $7.2 million in September for a $5 million steam plant near Iowa Falls to be integrated with the Iowa Electric Light & Power Co system. The utility has agreed to service the co-op starting in 1956 until the co-op can get its own 33,000-kw plant built in 1962.

• Tri-State Generation and Transmission Association and Colorado-Ute have firm applications for loans of $10.5 million and $9 million, respectively, filed with REA. Tri-State is carrying on engineering studies, and Colorado-Ute plans to go ahead on similar deals with local power firms.

• Tri-County Electric Association, Inc, and a group in southeast Colorado, termed the Southeast Colorado G&T group but as yet not listed as an REA borrower, also plan to submit applications. Tri-County wants $3.5 million as a G&T loan to tie in with Black Hills Power Co on an operational agreement, then it plans to ask for $1.5 million more for distribution facilities. The Southeast group also wants $3.5 million to make an arrangement with the Southern Colorado Power Co.

Whether these efforts come to fruition remains to be seen. But, successful ones may give rise to more in the years to come.

Changes in Capacity Reported to FPC

PLANT ADDITIONS DURING SEPTEMBER

State	Utility	Plant	Fuel	Capacity (Kw)
Me.	Rumford Falls Power Co	Lower	H	12,800
Me.	Bangor Hydro-Electric Co	Graham Station	S	11,500
N. Y.	Niagara Mohawk Power Corp	Albany	S	80,000
N. Y.	Central Hudson Gas & Electric Corp	Danskammer	S	60,000
Pa.	Pennsylvania Power & Light Co	Martins Creek	S	132,500
Ind.	Public Service Co of Indiana	Wabash River	S	90,000
Mich.	Charlevoix Municipal Utilities	Charlevoix	IC	1,000
Minn.	Mountain Lake Municipal Light & Power Plant	Mountain Lake	IC	1,136
Kan.	Johnson Municipal Power Plant	Johnson	IC	230
Kan.	Ellis Municipal Electric Light & Water Plant	Ellis	IC	565
Ga.	Georgia Power Co	Hammond	S	100,000
Ky.	Kentucky Utilities Co	Green River	S	60,000
Ky.	Tennessee Valley Authority	Shawnee	S	135,000
La.	Ruston Municipal Water & Light Department	Ruston	IC	3,080
La.	Gulf States Utilities Co	Louisiana Sta #1	S	55,000
Colo.	La Plata Electric Association	Pagosa Springs	H	200
Ariz.	Salt River Project Agricultural Improvement & Power District	Kyrene	S	30,000
Ore.	Army Corps of Engineers	McNary	H	70,000
Calif.	Los Angeles Department of Water & Power	Valley	S	100,000
Calif.	Pacific Gas & Electric Co	Pittsburg	S	156,250

PLANT RETIREMENTS DURING SEPTEMBER

N. Y.	Arcade Municipal Electric Department	Arcade	S	200
Ohio	Bluffton Municipal Light Plant	Bluffton	S	3,750
Ill.	Commonwealth Edison Co	Dixon	S	3,000
Minn.	Mountain Lake Municipal Light & Power Plant	Mountain Lake	IC	136
Iowa	Denison Municipal Utilities	Denison	S	500
Kan.	Ellis Municipal Electric Light & Water Plant	Ellis	IC	135
Wash.	Puget Sound Power & Light Co	Olympia	H	1,750

H—Hydro, IC—Internal Combustion, S—Steam.
United States Capacity as of Oct. 1—Hydro, 22,883,417 kw; Internal Combustion, 2,262,772 kw; Steam, 74,010,135 kw; Total, 99,156,324.

English Firm Wins Bid for Table Rock Turbines

Administration officials softened their "Buy American" policy last week in awarding two Table Rock Dam turbines to the English Electric Export & Trading Co.

The British low bid of $1,066,662 was only 11.8% under the American second bid of $1,191,715 by Newport News Shipbuilding & Drydock Co. Since the "Buy American" act was enacted in 1933, the narrowest margin that had previously won an award for a foreign low bidder was 18%.

"Buy American" legislation allows a government agency to add 25% to a foreign low bid for comparison with the bid of a U. S. firm. Practice has been to apply the full 25% differential pretty generally in evaluating bids.

Unlike electrical equipment, turbines have been bid on a firm price basis for several years. The turbine builders eliminated escalator clauses from their bids, substituted a price adjustment formula keyed to a special

Central Maine Dedicates Harris Plant

Central Maine Power Co has added another 75,000 kw to its system with the recent dedication of the Harris Plant at Indian Pond on the upper Kennebec River. The plant was named in honor of Ford W. Harris, the firm's chief engineer.

The $20-million project brings Central Maine's total hydro capacity to 266,000 kw.

Pres William F. Wyman warned at the dedication that the narrowing margin between steam and hydro costs would necessitate closer appraisal of each new situation in relation to fuel burning costs and future progress in atomic energy.

Wyman also said that if areas served by government power projects had to bear all the costs of such operations "we would quickly see an end to the extravagant claims and unfavorable comparisons in favor of government power being made by its advocates."

Bureau of Labor Statistics index similar to the one recently accepted by the electrical manufacturers in bidding on generators for the Dalles Dam (EW, Oct. 18, p 105).

Bids for the two Table Rock turbines had to be adjusted only for the credits that the various bidders were willing to allow the government for the expense of model tests. English Electric included no credit for this work in its bid; Newport News offered a deduction of $18,410 on a total bid of $1,210,125, reducing the net cost to the federal government to $1,191,715.

Five bids for the Table Rock turbines were opened Sept. 29 at the Little Rock district office of the Army Corps of Engineers. Four U. S. firms submitted prices. Following the second low bid by Newport News, the other gross bids, with deductions for model tests, were: Allis-Chalmers Manufacturing Co, $1,238,540, less $23,000 credit; S. Morgan Smith Co, $1,316,205, less $25,000, and Baldwin-Lima-Hamilton Corp, $1,350,000, less $17,000.

Table Rock Dam is on the White River in Missouri near the Arkansas state boundary line, upstream from the reservoir impounded by Bull Shoals Dam.

Several American bidders were preparing formal protests to the award in letters and telegrams to the Defense Department. It was noted that the contract was given to a foreign manufacturer although the differential between the foreign bid and the low domestic bid was less than one half of the 25% traditionally required under the "Buy American" Act.

In calculating the "savings" supposedly accruing from the award, American manufacturers pointed out, no consideration was given to the corporate and individual income taxes which would have been paid if the contract had been awarded to a domestic manufacturer.

Election Results

(*Continued from page* 102)

Peoples Utility District proposals which would have meant loss of service territory to Pacific Power & Light in Lincoln and Tillamook Counties. In Union County, voters approved dissolution of the Union County PUD. This followed two rejections earlier in the year of a $4.5-million bond issue. Union County is served by California-Pacific Utilities Co.

In Portland, voters balloted almost 2 to 1 to tax themselves 1½ mills, or $1 million annually for ten years in order to modernize and improve street lighting. The vote was the answer to criticisms that Portland had the worst street lighting in the nation.

California Water Rights . . . Voters of California approved a constitutional amendment requiring governmental agencies to conform to state water laws in the future acquisition of real estate for use in connection with water development projects.

The proposition received a large majority despite arguments it was an "attempt to create a hidden veto to be used to prevent further federal reclamation projects like the Central Valley Project, with their attendant low cost power and water benefits."

Colorado voters empowered the State Public Utilities Commission to regulate the "facilities, service and rates" of all privately owned utilities in Colorado. For years home rule cities had been beyond the PUC's control, causing court fights and ballot tests in recent years. The amendment had been favored by the private utilities.

In Arkansas, the election of Orval E. Faubus, Democrat, brings in a governor who was part of the administration of former Gov Sid McMath who has battled Arkansas Power & Light Co for years over public power. Faubus is known to share McMath's sympathies for rural electric cooperatives.

Ohio voters in Hudson voted against plans to sell the municipal plant to Ohio Edison Co. Similar proposals in Genoa and Waterville were also defeated.

More News on page 224

Booklet Urges Planned Tree Planting

Trees and utility wires associating with each other harmoniously is the theme of Detroit Edison Co's booklet, "Planting for Permanent Beauty." Aimed at the home owner, the 16-page color book emphasizes how streets, neighborhoods, and private lots can be beautified by planned tree planting.

Included in the booklet are sketches showing the right and wrong locations to plant trees around the home and hints on how to plant and care for saplings. Color photographs and detailed descriptions are given of 11 "good conduct" trees. Also listed are other trees which thrive in the locality, are clean, require little care, and are unlikely to grow into utility lines, clog sewers, or heave sidewalks.

A page on the work done by Edison tree trimmers in maintaining service continuity concludes the booklet. Severe tree trimming, Edison points out, usually is necessary only when tree planting has been unplanned.

Contest Booklet Holds Attention of Educators

A better lighting contest sponsored by Ohio Edison Co continues to attract interest even though the contest has been closed for weeks.

A number of educators have requested copies of the contest booklet to use for class project work. One school, alone, has requested 4,500 copies.

The 28-page contest entry booklet included the complete story of good lighting in the home and line drawings of the major rooms in the home with furniture in place. In the back of the book were 8 gummed-stock pages of lamps and lighting fixtures. The pages contained both good and bad lamps and fixtures. Under each illustration was a brief description of the size bulb the lamp of fixture uses.

The entrant had to study the story of good lighting and then determine from the information below each lamp or fixture which was correct. He then cut out the lamps or fixtures and pasted them into position in the various room pictures.

Prizes totalling $5,000 were awarded to junior and senior high school students who entered the contest.

Farm Entrants Heavy

Farms, 1,598 of them, having a total acreage of 670,422 have entered the soil and water conservation phase of the "Finer Carolina" contest sponsored by Carolina Power & Light Co. Owners of the farms are competing for $2,800 in cash prizes.

Daytime TV Audiences Larger, Survey Shows

Wondering what kind of an audience your daytime television shows are pulling?

Cunningham & Walsh, Inc, New York advertising agency, has released a report which shows 14% of TV set owners watched television in the mornings this year, as compared to 8% last year. In the afternoons 16% of owners watched, compared to 14% last year.

The survey was made in New Brunswick, N. J. dubbed "Videotown" by C&W which has been making TV studies there since 1948. It revealed that while viewers were crowding more different activities into their leisure hours, they still had just as much time as ever for watching favorite TV shows. The agency also added that telecasts in color are still too far from the experience of the average person in Videotown (only 8% have seen one).

NAM Weekly TV Series Commences 5th Year

National Association of Manufacturers' weekly film series, "Industry on Parade," last month began its fifth year on the air.

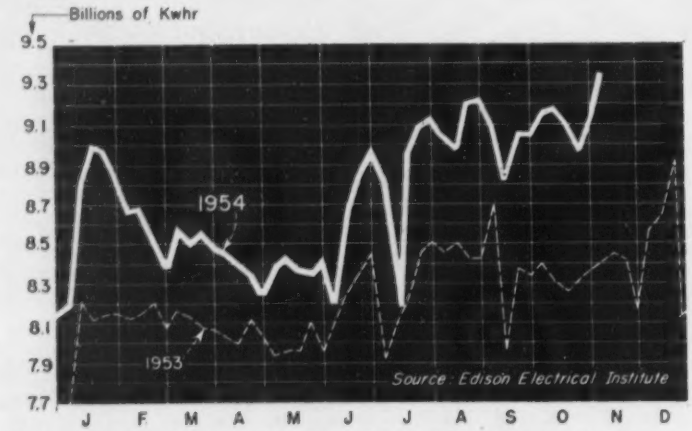
Now carried on some 234 television stations, the 15-minute industrial newsreel has featured the activities of eight electric utilities and 20 electric equipment manufacturers.

In recognition of its accomplishments, the program has received four consecutive annual Freedoms Foundations awards, three honorable mentions from Ohio State University and a blue ribbon from the New Jersey State Fair.

Hunting New Industries?

"Finding Prospects for Community Industrial Development" is the title of a booklet now available from the Department of Manufacture, Chamber of Commerce of the United States, 1615 H Street, NW, Washington, D. C. Price for a single copy is 50¢ with reduced prices for two or more copies in bulk.

STATISTICS



Output Week Ended Nov 6—9,357,000,000 Kwhr

Per Cent Change from Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Nov. 6	+11.4	+2.5	+6.1	+7.5	+5.9	+24.2	+11.2	+4.9	+7.3	+8.0
Oct. 30	+9.4	+0.9	+3.2	+3.9	+5.6	+20.4	+14.3	+4.3	+8.2	+8.9
Oct. 23	+8.8	−0.4	+2.8	+4.5	+4.6	+22.2	+5.0	+0.9	+5.9	+8.2

Seasonally Adjusted Index 177.1 Week Ago 173.5 Year Ago 159.1

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load ‡(Million Kw)	Aug.	79.7	78.2	74.3
Capacity (Million Kw)	Sept.	99.16	98.08	87.59
Production (Billion Kwhr)	Aug.	41.17	40.08	38.53
Hydro	Aug.	8.34	8.76	8.45
Fuel	Aug.	32.82	31.32	30.08
Fuel Consumption:				
Coal (Million Tons)	Aug.	9.83	9.40	9.71
Oil (Million Barrels)	Aug.	4.85	4.45	6.54
Gas (Billion Cu Ft)	Aug.	130.49	127.37	112.88
Sales (Billion Kwhr)	Aug.	33.88	32.99	32.82
Residential	Aug.	9.65	9.50	8.48
Commercial	Aug.	6.66	6.52	5.98
Industrial	Aug.	14.90	14.35	15.83
Other	Aug.	2.68	2.62	2.52
Net Income Class A & B Companies ($ Million)	Aug.	89.43	84.44	77.24
Estimated Dec. '54 Peak ‡(Million Kw)	Aug.	88.0	88.1	91.9
Kwhr per Residential Customer (12 Month Average)	Aug.	2,476	2,458	2,287
Revenue per Kwhr Residential Service (12 Month Average)	Aug.	2.71¢	2.71¢	2.75¢
Canadian Production (Billion Kwhr)	Aug.	5.46	5.48	5.09

Business Statistics

FRB Industrial Production Index†	Sept.	126	124	135
Gross National Product Annual Rate ($ Billion)	2nd Qtr.	356.0	355.8	369.9
EW 4 Industry Production Index†	Sept.	117.0	115.4	124.9
ENR Construction Cost Index†	Oct.	134.6	134.3	128.0
BLS Consumer's Price Index	Sept.	114.7	115.0	115.2
NEMA Insulation Materials Sales Index†	Aug.	111	92	153
NEMA Electric Appliance Sales Index†	Aug.	91	88	90
NEMA Household Refrig. Sales Index†	Aug.	71	93	63
Metal Prices (Nov. 9)				
Copper, Conn. V., lb		.30¢	29.7¢	28.9¢
Lead, N. Y., lb		.15¢	.15¢	.13½¢
Zinc, prime Western E. St. Louis, lb		.11½¢	.11½¢	.10¢
Tin, Straits, qual. N. Y., lb		.91¾¢	.93½¢	.82¢
Aluminum, ingot, base price		22.2¢	22.2¢	.21½¢
Nickel, base price		.60¢	.60¢	.60¢
Steel, billets, Pitts., ton		$64.00	$64.00	$62.00
Steel, scrap, No. 1 heavy, Pitts., ton		32.00	32.00	36.00

*Preliminary **Revised ‡Class 1 System †1947-49=100 ††1949=100

September Construction Stays At Record High

September saw no drop in the all-time monthly high for new construction work put in place in August, a total valued at $3.6 billion. That was 8% above September last year, and brought the total for the third quarter to the level of a record $10¾ billion, or 7% more than the 1953 third quarter.

Reasons for this lie in the continued gains in private residential and commercial building, state and local government construction, and private school and church building.

Private residential building amounted to $1,296 million during the month, a 20% gain over last year, and only slightly under the peak volume of $1,322 million of August and September 1950.

September Construction
(millions of $)

	1954	1953
Private Construction	$2,440	$2,200
Residential (non-farm)	1,296	1,093
New dwelling units	1,165	965
Additions	106	103
Nonhousekeeping	25	25
Nonresidential building	551	505
Industrial	160	177
Warehouses, office and loft buildings	89	71
Stores, restaurants, garages	118	104
Other nonresidential	184	153
Religious	57	44
Educational	54	40
Hospital, institutional	29	27
Social, recreational	19	15
Miscellaneous	25	27
Farm construction	153	170
Public utility	428	422
All other private	12	10
Public Construction	1,179	1,162
Residential	23	46
Nonresidential building	427	380
Industrial	127	147
Educational	192	153
Hospital, institutional	35	26
Other nonresidential	73	54
Military facilities	86	118
Highway	445	428
Sewer and water	97	81
Miscellaneous public service	21	24
Conservation, development	66	73
All other public	14	12
Total private and public	3,619	3,362

Source: Dep't of Commerce, Business and Defense Services Administration

PUD Rejects Offer

Stevens County, Wash., district turns down WWP bid of $2 million for PUD's property

Commissioners of the Stevens County (Wash.) Public Utility District have rejected an offer by Washington Water Power Co to buy out the PUD for more than $2 million (EW, Nov. 8, p 5). The WWP offer was believed to be the first by a private company to purchase a public utility district.

WWP answered the rejection of its offer with a statement that more than 80% of the Stevens PUD customers apparently want to sell to the private firm. Since making the offer by letter late in September, WWP has been polling PUD customers, according to company spokesman.

WWP Hoped to Buy PUD . . . Kinsey M. Robinson, WWP president, said the company hoped to purchase the Stevens County properties to avoid any possibility of conflict between it and the PUD when a new $4.3 million transmission line is built between Spokane and the Waneta, B. C., power plant of Consolidated Mining & Smelting Co of Canada.

Commissioners of the PUD pointed out, however, that "a PUD cannot condemn private property unless it can show use and necessity," and that private power companies have many miles of transmission lines across counties served by public utilities.

The PUD letter rejecting the purchase proposal was signed by Joe Garvey, district president; D. L. McKern, secretary, and W. D. Smith, commissioner.

It said in part, "We were informed that you were assigning survey employees into Stevens County under the pretense of learning the views of customers and citizens of the area. We find that these people are not making a public survey but are contacting present customers of the PUD urging them to sign a petition calling for this commission to sell the PUD properties to you.

"It is the unanimous decision of the commission to continue the legal action to acquire Washington Water Power distribution in this county."

(*More Financial on page* 216)

Today in Utility Finance

YIELDS (%)

Quality	Bonds 1st	Bonds 2nd	Bonds 3rd	Preferred Stocks 1st	Preferred Stocks 2nd	Preferred Stocks 3rd	Common Stocks 1st	Common Stocks 2nd	Common Stocks 3rd
DATE									
Nov. 4	**2.87**	**2.91**	**3.11**	**3.87**	**4.00**	**4.36**	**4.57**	**4.86**	**5.25**
Oct. 28	2.88	2.90	3.09	3.88	4.00	4.37	4.63	5.06	5.36
END OF QTR.									
3rd 1954	2.88	2.90	3.10	3.89	3.99	4.38	4.50	4.80	5.19
2nd 1954	2.90	2.96	3.19	4.03	4.14	4.48	4.72	5.04	5.45
1st 1954	2.82	2.87	3.14	3.88	4.09	4.42	4.83	5.19	5.42
4th 1953	3.07	3.12	3.34	4.17	4.32	4.62	5.07	5.57	5.51

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months Ended		Net Income 1954	Net Income 1953	Earnings Per Common Share 1954	Earnings Per Common Share 1953
Arkansas Power & Light	12	Aug	$7,584,004	$6,146,244	$....	$....
Commonwealth Edison and subsidiaries	12	Sept	42,145,375	36,359,273	2.54(a)	2.34(a)
Community Public Service	9	Sept	1,321,868	1,366,263	....	....
Consolidated Gas, Electric, Light and Power of Baltimore	12	Sept	10,930,000	10,878,000	1.77(b)	1.92(b)
Consumers Power	12	Sept	26,078,590	23,523,386	3.11(c)	3.06(c)
Dallas Power & Light	12	Sept	5,829,938	5,038,247	....	....
Delaware Power & Light	12	Sept	4,625,793	4,147,195	2.07(f)	2.06(f)
El Paso Electric	12	Sept	2,080,946	1,647,501	2.36(g)	2.07(g)
Gulf States Utilities	12	Sept	9,668,096	8,879,831	1.93	1.74
Interstate Power and subsidiaries	12	Sept	2,528,943	2,507,571	0.95	0.94
Minnesota Power & Light	12	Sept	3,570,024	4,018,125	....	....
Mississippi Power	12	Sept	2,176,268	2,337,904	....	....
Northern Indiana Public Service	12	Sept	9,554,270	8,961,840	2.29(h)	2.39(h)
Northern States Power (Minn)	12	Sept	16,932,768	16,039,108	1.12(i)	1.10(i)
Northwestern Public Service	12	Sept	825,078	930,868	....	....
Pacific Power & Light	12	Sept	5,769,081	6,337,941	1.54(j)	1.71(j)
Pennsylvania Power	12	Sept	2,616,706	2,306,662	....	....
Philadelphia Electric	12	Sept	30,848,877	29,227,398	2.25(k)	2.33(k)
Shawinigan Water & Power	9	Sept	4,835,643	4,242,796	1.86	1.59
Texas Power & Light	12	Sept	10,039,597	8,907,162	....	....
Union Electric Co of Missouri	12	Sept	16,625,604	13,192,691	1.60	1.27

Notes—(a) Based on 16,607,050 shares in 1954 and 14,345,683 shares in 1953; (b) Based on 5,576,551 shares in 1954 and 5,213,866 shares in 1953; (c) Based on 7,303,939 shares in 1954 and 6,588,472 shares in 1953; (f) Based on 1,858,879 shares in 1954 and 1,627,640 shares in 1953; (g) Based on 840,387 shares in 1954 and 763,988 shares in 1953; (h) Based on 3,509,799 shares in 1954 and 3,134,478 shares in 1953; (i) Based on 12,701,232 shares in 1954 and 12,198,633 shares in 1953; (j) Based on 3,331,943 shares in 1954 and 3,326,891 shares in 1953; the 1954 figure is after "Provision for Deferred Income Taxes Resulting From Accelerated Amortization"; and (k) Based on 11,763,802 shares in 1954 and 10,804,852 shares in 1953.

FINANCING

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF NOVEMBER 4-10			
Bonds			
Sierra Pacific Power—1st mtg 3¼% due 1984	$4,000	101.997%	3.27%
SCHEDULED FOR NOVEMBER—DECEMBER—JANUARY			
Bonds and Debentures			**Bid Date**
Public Service Co of New Hampshire—1st mtg	$12,000	.....	Nov. 30
New Orleans Public Service—1st mtg due 1984	6,000	.....	.....
Kansas Power & Light—1st mtg due 1984	8,000	.....	.....
Commonwealth Edison—conv debs	50,000*	.....	Jan. 11
Preferred Stock			
Interstate Power—200,000 sh $50 par	$10,000	.....	Nov. 30
Mississippi Power & Light—44,476 sh $100 par (to be offered in exchange for outstanding $6 pfd on a sh-for-sh basis, plus a cash difference between initial public offering price of new shares and redemption of the old shares)	.....	.....	.....
Black Hills Power & Light—9,950 sh 4.75% $100 par cum	995	.....	(a)
Black Hills Power & Light—39,900 sh $25 par	998	.....	(b)
Patchogue Electric Light—750 sh $1,000 par	750	.....	.....
Common Stock			
Virginia Electric & Power—600,020 sh (to be offered common-holders on 1-for-10 basis, record Nov. 23 with an over subscription privilege)	.....	.....	Nov. 23
UNSCHEDULED AND/OR UNDER CONSIDERATION			
Bonds			
Long Island Lighting—1st mtg	$15,000	.....	.....
Connecticut Light & Power—1st mtg	10,000	.....	.....
Kentucky Utilities—1st mtg	15,000	.....	.....
Kansas City Power & Light—1st mtg	16,000	.....	.....
Preferred Stock			
Black Hills Power & Light—10,000 sh $100 par	1,000	.....	.....
Central Power & Light—75,000 sh $100 par	7,500	.....	.....

Notes—* Estimated. (a) to be sold privately, and (b) Dillion, Read & Co Inc, group underwriters.

ENGINEERING MEETING

Human Error Causes Half Power Plant Outages

PEA Electrical Equipment Committee is advised that human engineering could help correct this situation. Centralized control boards discussed by group

Half the forced outages in power plants are caused by human error, Dr M. A. Tolcott, secretary, Dunlap & Associates, told the Pennsylvania Electric Association's Electrical Equipment Committee, Oct. 19-20, at Newark, N. J.

Human Engineering—the study of the man-machine relation—could help to correct this situation, Tolcott said. Some of the suggestions he offered were: Use of operating procedure check lists, color coding of instruments, and arrangement of instruments in the sequence in which they are used. He also stated that when a man is a component of a control or operating system, his work must be made active and interesting.

Dr A. Chapanis described human engineering experiments conducted at Johns Hopkins University that resulted in new scale lettering, instrument positions, and scale divisions.

Modern Control Boards . . . Because of reliable equipment the boiler, turbine and generator now function as a unit system so that it is not only logical but extremely important to operate and control these components as a unit, H. L. Lowe, chief electrical engineer, Ebasco Services, Inc, told the committee. To accomplish this, a compact centralized control board was designed in 1948. Acceptance of this new type board has been excellent. This is indicated by the fact that no user has returned to separate control boards after installing a combined board.

Public Service Electric & Gas Co has decreased the panel space for centralized control boards in its new generating stations, said J. Fain. He also stated that panel layouts have been facilitated by full scale plywood models. Full scale photographs of the instruments are arranged on these models to provide help for designers.

P. S. Dickey, vice president, Bailey Meter Co, indicated that the various types of new control boards save in first costs (on kw basis), save in operating expense, and prove to be reliable and increase overall performance. J. B. Tully, Minneapolis-Honeywell Regulator Co, and W. E. Ruflegh, Bristol Co, described new miniature type instruments.

Both P. H. Robbins, Metropolitan Edison Co, and G. E. Dana, New York State Electric & Gas Corp, indicated that prefabricated galvanized metal is favored as substation control house building material. Insulated windowless buildings with fixed louvers are used by Metropolitan Edison. Heated and insulated buildings are used by New York State because they insure proper operation of control relays and full output on control battery.

Martins Creek Data Given PEA Prime Movers Group

Information about Pennsylvania Power & Light's new Martins Creek Plant, in addition to that already published in Electrical World (March 22), was given to the members and guests of the Prime Movers Committee of the Pennsylvania Electric Association, Oct. 21-22, at Skytop.

The cost for unit No. 1 and future unit No. 2 will be less than $150 per kw, according to S. C. Townsend. M. D. Engle indicated that the savings in outdoor plants resulted from the omission not only of large plant structures but also of walls, tiling, heating, and some plant lighting. He said however that the problem of providing shelter for maintenance work is far from solved.

Seismology was used to determine the depth of the rock foundation, Engle said. This investigation indicated that the depth of the rock varied from 12 to 50 ft. He also stated that the outside diameter of the LP turbine blading was held down by tapering the turbine cylinder. Engle said that as low cost of construction was very important for this low load factor plant, auxiliary equipment was held to a minimum. One means to achieve this was to use a mobile crane for moving auxiliary equipment instead of the usual system of monorails.

Personnel Selection . . . W. H. Kopenhaver, Martins Creek's Plant Superintendent, said 497 of 1,000 men asked, said they would like to work at this new outdoor plant. Of this number, 411 were selected to be interviewed for the 63 positions available. Those selected were assigned to the plant during the construction phase. They received instructions at this time from both company engineers and manufacturers' representatives. Engle said there were few startup troubles although an amazing amount of debris was found in the oil used to flush out the turbine oil system.

Weekend maintenance of the boiler is facilitated by the fact that it is completely drainable, said G. I. Smith, Foster-Wheeler Corp. He also indicated that the use of thermocouples aids quick startups.

In discussing possible future thermal cycles, D. T. Stewart, Foster-Wheeler, suggested a cycle combining a gas turbine with a highly pressurized boiler for superior thermal economy.

Demineralization . . . Discussion disclosed that demineralization could not be justified at Martins Creek because of idle status of the equipment elsewhere and dependence upon evaporators in plants visited. However, E. I. Gallagher said that demineralization equipment is being successfully used at Philadelphia Electric Co plants, and has the advantage of producting makeup even if the boiler is operating a low output.

WASHINGTON COMMENT

Election of Richard L. Neuberger to be the first Democratic Senator from Oregon in 40 years is doubly significant. It was the paper-thin Democratic majority in this balloting that shifted the next Senate from Republican to Democratic hands. It was this vote, too, that ousted the most knowledgeable exponent of Republican power policy, Sen Guy Cordon, the shy country lawyer who ruled Congress on most power matters.

Oregon Gets Another Public Power Senator

The Neuberger victory, if sustained in the final counts, moves into national politics a young Democrat whose formative years were nurtured by supping at the table of New Dealers of prominence—he once was a White House luncheon guest of the late Franklin D. Roosevelt. He is a true FDR disciple, but his idealism also prompted him in 1952 to observe that perhaps it was time for a change from Trumanism and 20 years of one party.

While advancing a nationally recognized writing career for such magazines as Harpers, The New Republic and The Progressive, Neuberger had been running for some unnamed high Oregon office since he returned from Army service in 1944. It was just a question of which year and which office.

Republican Year Sets Stage . . . The heavily Republican year of 1952 focused attention on the Democratic aspirant. That year Neuberger and his wife outdrew the Eisenhower tally in metropolitan Portland while he was up for reelection to the State Senate and his wife for a first term in the lower house.

As a team they made headlines, and he frequently was asked "When will you run for governor . . . or will it be senator?" One story is that Senator Cordon's vote on the tidelands bill prompted Mrs Neuberger to demand that her husband run for senator. The elections earlier this month sent her back for a second term in the Oregon House and her husband to Washington to become the first Democratic senator from the state since 1914.

A pleasant, bald, easy-to-meet man, Neuberger capitalized on a number of long nurtured assets to gain his victory. His writings as a conservationist have endeared him to salmon loving anglers who fight the construction of dams and to outdoor addicts of which there are legions in the Pacific Northwest. His down-the-line New Deal writings on the power issue brought him support from labor organizations and public power advocates.

Views by Norris . . . For Neuberger's power and political views one has to read no further than the philosophy of the late Sen George Norris, father of the Tennessee Valley Authority and one of the chief authors of the Rural Electrification Administration. Neuberger idolized Norris, wrote the Norris biography, "Integrity." With the tenderfoot authority accorded a freshman senator, Neuberger intends to pick up the New and Fair Deal public power pennants which Norris helped to raise.

But while Neuberger's writings have clearly defined his own thinking on the federal vs private power issue, the significance of his election is subject to widely differing interpretation.

One of the most vocal of the public power spokesmen in the Pacific Northwest believes that Neuberger did not make an issue of a straight public vs private power question with his candidacy, and therefore his election is not a mandate for public power. This spokesmen notes that Neuberger did not once mention local distribution but talked of the job of the federal government to build the major dams but not necessarily all of them. However, Neuberger did speak of the sale of a Bonneville Power Administration transmission line to a private utility and the Hells Canyon decision by Interior Department at the same time he talked of the "giveaway" policies of the Republican Administration.

An electric company executive in the area gives some substance to the public power view. But this official, too, fails to see power as a significant factor in the election of Neuberger. He points out that the re-election of Gov Paul Patterson, a pro-Ike, pro-Cordon candidate, was by a 80,000-vote majority while Neuberger scraped by a bare 3,000-vote margin. Two Republican Congressmen also gained substantial majorities even though hot local public power fights raged in their districts.

Better Salesman . . . This private power executive observes that Neuberger was an ingenious and energetic campaigner creating slogans that did not require thinking by the voters. In contrast this spokesman observes, the Republicans failed to sell the partnership policy and suffered from circumstances on a national level.

Another electric company executive in the area sees the partnership policy in a more difficult position. "It might have been difficult to sell anyway," he said, "but now it is increasingly so." He adds, however, "There has not been a repudiation of partnership to justify abandonment by the Administration."

The pro-Eisenhower Oregonian editorialized that the National Administration had failed to put together a power policy satisfactory to a majority of the people in the Northwest. This newspaper expressed a "deep and abiding faith in the 'creative liberalism' " of the President but urged him to hammer out a long range policy going beyond the present partnership arrangements.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Self-supporting aerial cable may cost more than open wire, but it offers advantages in the field of safety, straight forward routing, reduced clearances, reduced pole-top congestion, and reduced tree trimming.

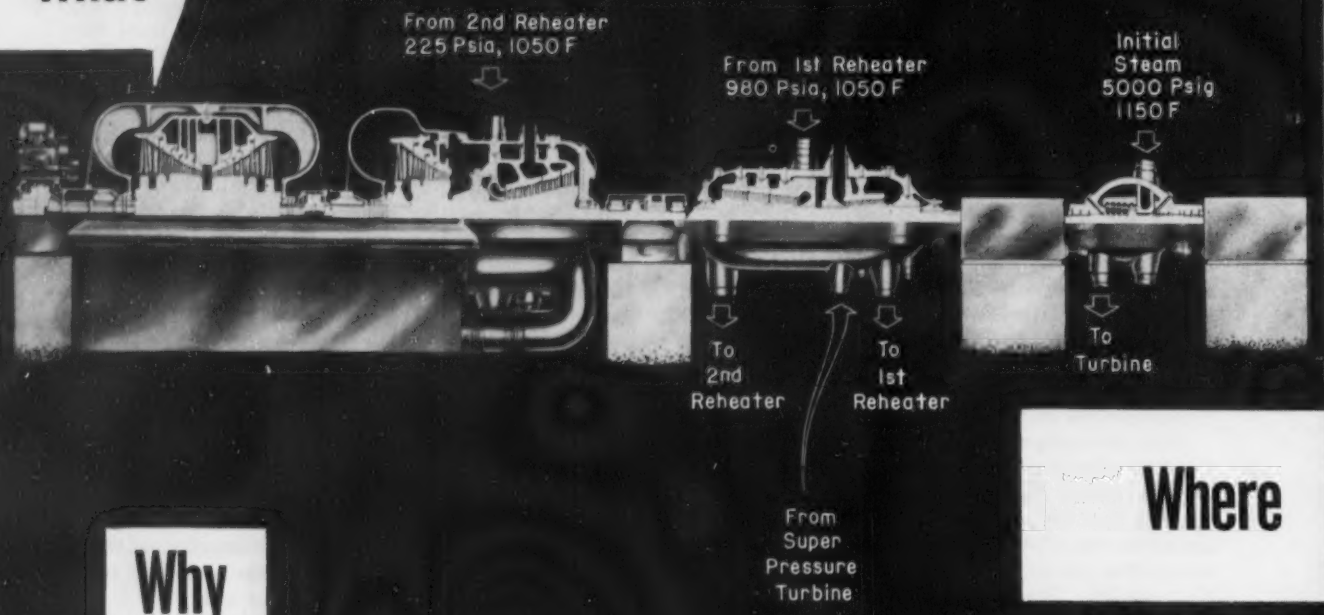
Saving through 1.2% net gain in thermal efficiency by cleaning a 150-Mw boiler could amount to more than $40,000 annually.

Capacitor switching performance of a circuit breaker depends on the characteristics of the system supplying the power as well as on the size of the capacitor bank.

Poison ivy infections and certain types of dermatitis are reported to respond to applications containing hydrous zirconium dioxide, carbonate, or lactate.

What

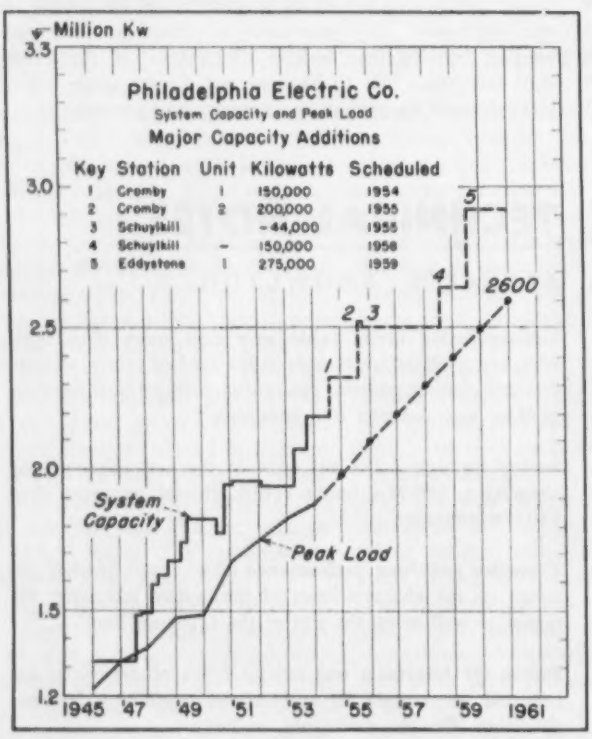
275-Mw Supercritical Pressure Installation



Where

An Artist's Conception

Why



New High Reached for

K. M. IRWIN Vice President, Philadelphia Electric Co, Philadelphia, Pa.

Philadelphia Electric Co announced plans in August (EW, Aug. 30, p 6) for a new supercritical-pressure, steam-electric station. The single-boiler-turbine-generator unit will operate at a higher steam temperature and pressure and will have a capability greater than any installation thus far announced. Using supercritical pressure and employing two stages of reheat, the new unit should be the most efficient plant thus far projected by the central station industry.

Westinghouse Electric Corp will design and build the 275-Mw turbine-genetrator. This is the largest unit ever ordered. The 6,000-psi steam generator, which will supply steam to the turbine at 5,000 psi, 1,200F, is being designed and constructed by Combustion Engineering, Inc.

The plant will represent an initial investment of about $45 million. It will be located at Eddystone

Philadelphia Electric's new unit will have a net plant heat rate of 8,400 Btu per kwhr at 1,150F

Supercritical Pressure

on the Delaware River, two miles northeast of Chester. Heavy industry, such as locomotive and turbine manufacturing, shipbuilding, and oil refineries, is located in this area.

Because of the intense interest in the reasoning that led to the decision to proceed with such a project, this supplementary article is now being published. However, it must be recognized that the overall design is still being studied and many technical details remain to be firmly established. What is presented here, then, is preliminary in nature and may change as further investigations are carried out.

System Growth . . . The company's service area is in the midst of a large industrial expansion. Industrial sales of electricity are growing at the rate of 7% annually.

Population has increased 15% from 1940 to 1950. Forecasts for the decade 1950 to 1960 indicate further growth, with estimates ranging up to 20% increase. The company has added 186,000 electric customers in the last six years and residential sales of electricity are growing at the rate of 8% annually.

Construction plans of the Philadelphia Electric Co are based on the assumption that this expansion will continue. The accompanying load and capacity curves show how generating capacity will be installed to meet the expected load growth. These reveal that in 1959, when the 275-Mw unit is in operation, it will represent slightly more than 10% of the system peak load. On an isolated system a unit of that size might be considered too large in terms of reserve requirements. However, as the company operates as part of the Pennsylvania-New Jersey Interconnection, the interconnected peak load can be used to determine reserve requirements.

Spinning Reserve . . . Operating experience has shown that a spinning reserve of 4½% of the interconnection peak load will give adequate protection against load curtailment because of errors in daily load estimates. Because 4½% of the estimated interconnection peak load for 1959 will be 400 Mw, the loss of a 275-Mw unit will be amply covered. This large unit becomes a logical addition to the system as service continuity will not be jeopardized if the unit is lost nor will the interconnection reserve requirements be increased. This unit should operate at a high load factor because of its low heat rate and the fact that only about 10% of the system generation will be hydro in 1959.

Selection of Unit Size . . . A cycle using supercritical initial steam pressure, with its correspondingly small specific volume, permits optimum turbine efficiency only with units of large output. For this reason and for the cost economies inherent in large machines a unit of 275-Mw capability was chosen for this new project. The net output to the system will be 250 Mw.

A turbine-generator unit of this capability has long been feasible if the low pressure turbine element operated at 1,800 rpm. More recently, however, advanced developments have enabled manufacturers to build large 3,600-rpm turbine-generators. These higher-speed units are particularly adapted to use with high inlet steam temperatures and pressures. The need to provide sufficient exhaust blade annulus to handle the large steam flow with acceptable leaving loss was the major turbine problem. This was solved by developing larger exhaust stage blading, providing multiple exhaust steam flow paths, and adopting thermal cycles which reduce exhaust steam flow in terms of lb per kwhr.

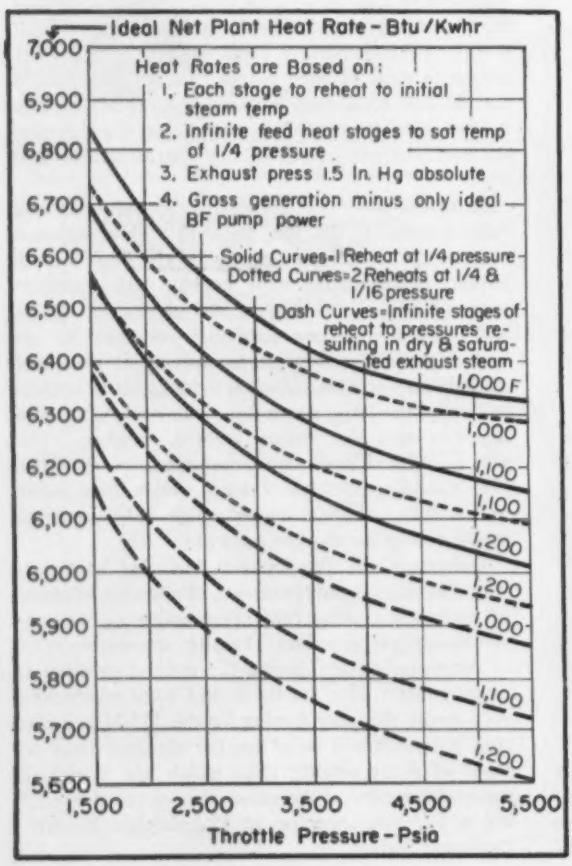
Generator size development has also kept pace with the turbine improvements. Following adoption of hydrogen cooling came progressive increases in ventilating gas pressures. Finally, the development of inner-cooling has placed the cooling medium in direct contact with the stator and rotor conductors. As a result, the rotor forging for the 275-Mw, 3,600-rpm generator will be of smaller diameter than are those of many smaller units which are already in successful service at the same rotative speed, including a 125-Mw machine at Philadelphia Electric's Delaware Station.

Philadelphia Electric's Net Station Heat Rates Decrease . . .

1. Schuylkill—42,000 Btu
4. Chester & Delaware—17,500 Btu
5. Chester—15,900 Btu
6. Richmond—13,500 Btu
7. Deepwater—11,700 Btu (Reheat)
8. Richmond No. 12—12,200 Btu
9. Schuylkill No. 3—12,000 Btu
10. Chester Station No. 5—11,600 Btu
11. Chester Station No. 6—11,200 Btu
12. Southwark No. 1 & 2—11,300 Btu
13. Barbadoes No. 3 & 4—11,600 Btu
14. Richmond No. 9—10,500 Btu
15. Delaware No. 7 & 8—9,500 Btu (Reheat)
16. Cromby No. 1—9,500 Btu (Reheat)
17. Cromby No. 2—9,500 Btu (Reheat)
18. Schuylkill—9,350 Btu (Reheat)
19. Eddystone—8,700 Btu (Double Reheat)

Expected design heat rate at capability output and 1150F—8,400 Btu.

Heat rates (except 8,400 Btu) are actual or expected annual net plant heat rates. They include operating and service factors and vacuum variations.



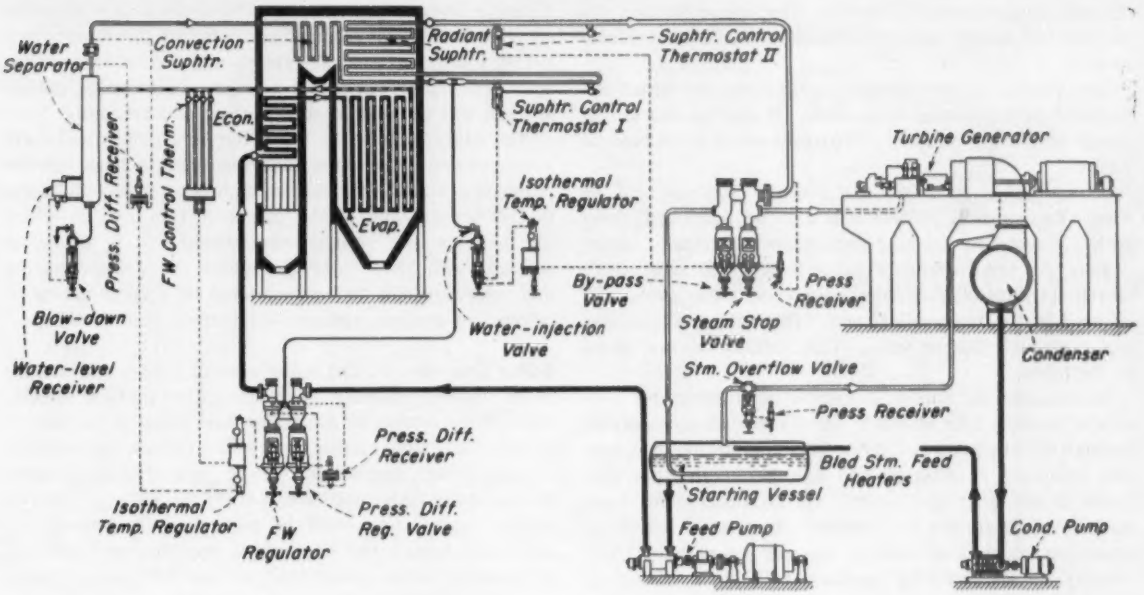
Realizable Cycle Gains . . . Although ideal cycle heat rates have no practical significance in themselves, they have proven to be easily used guides to the actual potential.

The ideal cycle is one having no losses in its components. Power required by an ideal boiler feed pump raising cold condensate to throttle steam pressure has been deducted from gross generation. The heat equivalent of such power consumption is added to the feedwater during compression. Regenerative feed heating is assumed under all conditions, based upon an infinite number of heating stages to a final temperature of compressed water equal to saturation at 25% of throttle steam pressure. This final feed temperature criterion approximates that used in practice.

The curves at the left show such ideal net plant heat rates plotted against throttle steam pressures. Temperature and number of reheat stages are the parameters with reheat in each case to initial steam temperature. The exhaust pressure is 1.5 in. Hg. Single stage reheat is assumed to be at 25% of the throttle steam pressure. For two stages of reheat, the first is at 25% of the initial pressure and the second is at 25% of the first reheat pressure. Small departures from these levels have little effect on the overall result. The theoretical influence of infinite stages of reheat is also shown. This is isothermal expansion to such a pressure that in an ideal turbine dry and saturated exhaust at 1.5 in. Hg would be produced.

The significance of these curves is shown by a comparison of ideal net plant heat rates with numerous modern plant heat rates obtained under guarantee conditions. The ratio of actual plant heat rates to ideal values for one stage of reheat lies in a band about 1% wide in the region of 73% of the ideal. This same percentage holds also for

Subcritical Monotube Boiler Is Basic to New Design . . .



calculated values of supercritical pressure cycles with two stages of reheat. It would therefore seem reasonable to say that the relationship between any two of the ideal curves represents the relative realizable gain in going from one set of conditions to the other. This then provides a quick means of estimating the improvement in heat rate obtainable from higher temperatures and pressures, and additional stages of reheat.

Monotube Steam Generators . . . Generation of steam at supercritical pressures requires modifications to conventional high-pressure water tube boiler design. In 1953 Combustion Engineering entered into a license and technical assistance agreement with the Switzerland firm of Sulzer Brothers, Ltd. This firm has had wide experience with once-through boilers. The accompanying diagram illustrates the working principle and controls of a subcritical pressure plant using a Sulzer monotube steam generator. A number of changes must be made to the controls and equipment when this principle is used for a supercritical cycle.

Under normal conditions the feedwater leaving the starting vessel is supplied by the feed pump and reaches the steam generator by passing through the pressure difference regulating valve and the feedwater regulator. In the steam generator the water first flows through the economizer and then goes directly to the evaporator where all but a small part of the water is changed to steam. This mixture of steam and water is next conveyed to the separator where the residual water is removed. The steam then passes through a flow metering device. This device provides one of the impulses for the feedwater regulating valve. The steam next returns to the steam generator entering the convection superheater and finally attaining the desired temperature in the radiant superheater. Steam at the proper temperature and pressure will then flow through the stop valve to the turbine.

The feedwater supply is automatically governed by a three-component regulating device. Two of the impulses are taken from the feedwater and steam flow. The third impulse is established by a thermostat, thus adapting the feedwater quantity to the heat input.

One or more thermostats, arranged along the superheater, regulate the final steam temperature by controlling the water injection. The automatic steam stop valve serves, together with the bypass valve, as a safety device. These valves protect the turbine against abnormal steam temperatures and pressures. In abnormal conditions and during the starting period, the steam stop valve closes automatically, and the steam or water and steam mixture is led through the automatic bypass valve to the starting vessel. With this arrangement any undue loss in condensate is avoided and the whole tube system, especially the superheater, is protected during starting and other unstable periods by maintaining flow. When the entire quantity of steam can not be condensed in the starting vessel, the excess steam is led through a steam expansion valve to the main condenser. Thus, undue loss of condensate is avoided.

Loss of feedwater supply or the oil in the control system automatically cuts off the fuel and air supply, the pressure being gradually reduced at the same time.

Supercritical Conditions . . . In many respects the C-E Sulzer Monotube steam generator represents a logical evolution of the design employed in the controlled-circulation boiler at the Cromby Station of Philadelphia

Electric. Many of the basic features on the new supercritical boiler will be patterned after this unit. Like the Cromby unit, it will have two separate furnaces with firing through tilting tangential burners. The square furnace will be over 100 ft high and will have conservative heat release rates.

Separation of the furnaces simplifies the structural problem of supporting large units. It enables the use of center supporting columns and permits access to all furnace walls.

Platen-type superheater and reheater surfaces will be used. Radiant-wall surface will also be employed along with a convection finishing section on the primary superheater. As small diameter tubes have given satisfactory service in controlled-circulation boilers, these tubes will be used in the supercritical unit. This tubing weighs less and has much thinner walls. This reduces thermal stress in the tubes.

In principle the Sulzer Monotube steam generator consists of a single tube which is led in repeated convolutions through the flue gases and around the combustion chamber. The feedwater is introduced at one end of the tube and leaves at the other end in the form of superheated steam at a fixed temperature and pressure. In practice the steam generator consists of several circuits in parallel. The velocity of the working medium is kept high enough in all sections of the tube system so that efficient cooling of the tube walls is insured in both the heating and superheating zones. The problem of distribution through Monotube circuits in the supercritical region is simplified because mixtures of steam and water do not occur.

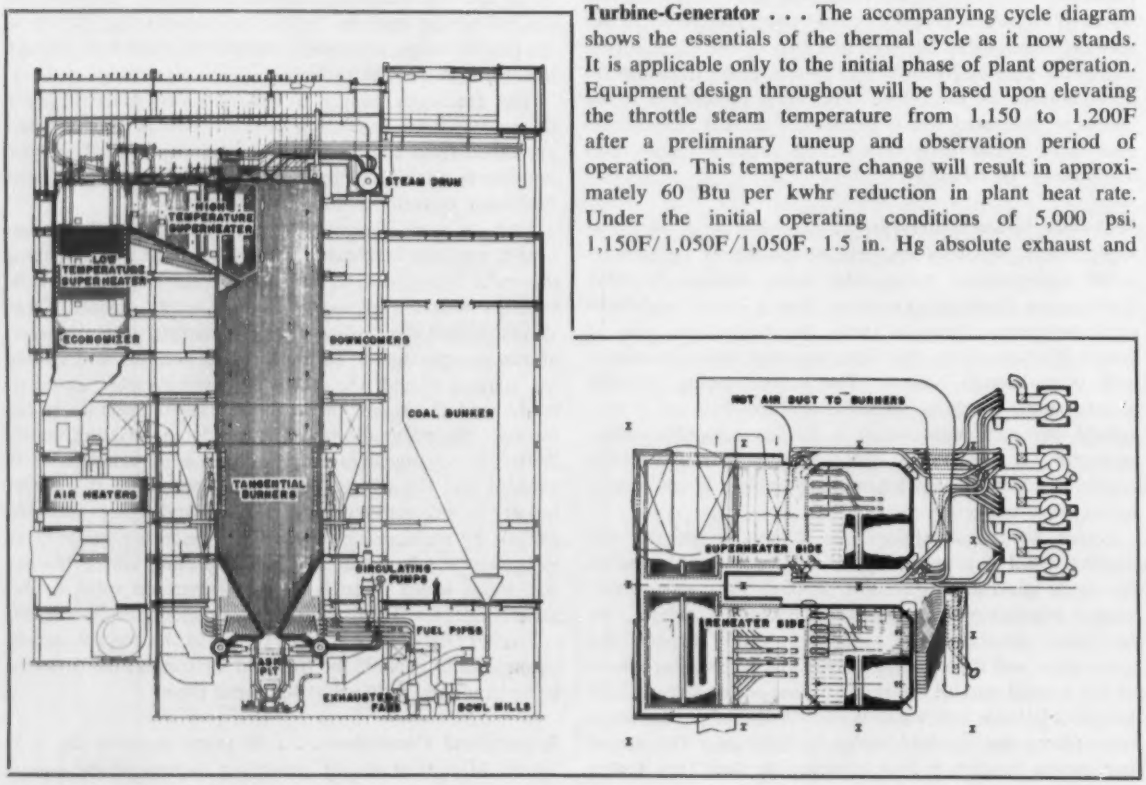
Arrangement of heating, superheating, and reheating surfaces is governed by the increased duty required of the superheaters and the double stage reheaters. At the Cromby Station, for example, 40% of the heat is absorbed by superheater and reheater surfaces. In the supercritical pressure unit this heat absorption will rise to 65% of the total heat input. Therefore a large proportion of radiant surface will be used in superheating and reheating.

The water supplied by the boiler feed pumps will enter a conventional economizer and then pass through a water preheating surface located in high heat absorbing areas in the burner zone of the furnace. The zone in which the fluid changes from water to steam will be placed in surfaces with lower heat absorption rates. Superheating and reheating will be accomplished in a combination of convection surface, radiant-wall surface, and platens.

Boiler Controls . . . The boiler control system will operate in the following manner. The water will be pumped directly through the system by the boiler feed pump in proportion to steam flow with vernier control from steam temperature. Primary steam temperature will be controlled by desuperheating spray under accurate multiple thermostatic control. Reheat temperatures will be controlled by burner tilt. Automatic bypass and stop valves, providing pressure and temperature limits, assure start-up and emergency protection of superheater, reheaters and turbine, functioning as required with the usual intercept valves.

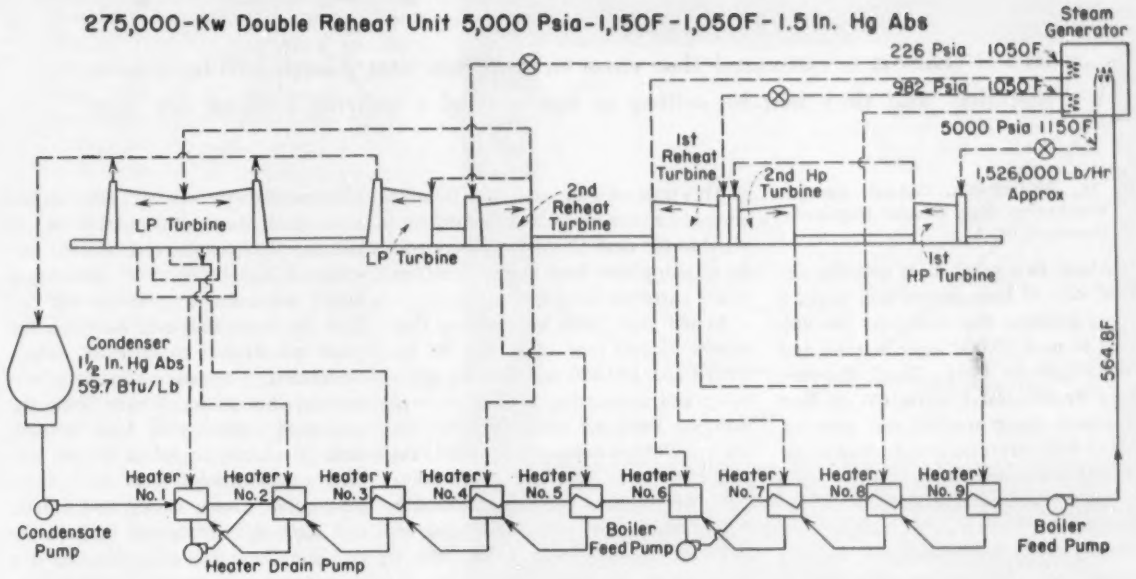
The Sulzer system of oil-hydraulic controls will be used for steam and water flow. These oil-hydraulic controls have been used for more than 20 years under a wide variety of steam conditions.

Turbine-Generator . . . The accompanying cycle diagram shows the essentials of the thermal cycle as it now stands. It is applicable only to the initial phase of plant operation. Equipment design throughout will be based upon elevating the throttle steam temperature from 1,150 to 1,200F after a preliminary tuneup and observation period of operation. This temperature change will result in approximately 60 Btu per kwhr reduction in plant heat rate. Under the initial operating conditions of 5,000 psi, 1,150F/1,050F/1,050F, 1.5 in. Hg absolute exhaust and



CONTROLLED-CIRCULATION BOILER of Cromby Station will be used as basis of design for new supercritical boiler. Philadelphia Electric Co will have had four years of operating experience with this steam generator before completion of supercritical unit in 1959

Preliminary Thermal Cycle Diagram . . .



feedwater at 565F, the plant heat rate should not exceed 8400 Btu per kwhr.

In arriving at these steam conditions, consideration was given to initial pressures up to 8,000 psi and temperatures to 1,250F. These, and even higher values, hold promise for further development. Reheat temperatures were limited to 1,050F on the basis of the thermal gain evaluated against incremental equipment cost. Two-stage rather than the prevailing single stage reheat is used because it is economical with higher initial steam conditions.

Westinghouse will supply the condenser, condensate and circulating water pumps, and feedwater heaters. While the cycle diagram shows nine-stage feedwater regeneration, with No. 6 serving also as a deaerator, further study may change the feed heating system in detail.

Although it is too early to discuss definite turbine design features, the project was initiated on the basis of using a single-shaft, tandem-compound turbine generator. Consideration is also being given to a cross-compound turbine generator arrangement, with the high and low pressure shafts operating, respectively, at 3,600 and 1,800 rpm. Such a unit would have a lower plant heat rate at high unit output because of reduced exhaust stage leaving loss. Corresponding fuel saving will be evaluated against the higher investment in plant equipment.

However, regardless of the final arrangement the small dimensioned primary turbine element and the control gear will be the only portions subjected to steam pressures or temperatures beyond the practical operating experience. This is important because it permits wide latitude in the selection of appropriate alloys, some of which might not be obtainable for the construction of large components.

Boiler Feed Pumps . . . Ingersoll-Rand Co has been assigned the responsibility for this portion of the plant. Extensive studies are being made of the location of the pumps in the cycle, load distribution between the several pumps, speeds, and drives. It is expected that a balanced impeller arrangement and packless seals will be incorporated in the design. For the required pressure of 6,000 psi it will be necessary to go to considerably higher speeds than heretofore, possibly in the order fo 6,500 rpm. This should not prove to be too difficult since Philadelphia Electric has had excellent results in four years operation of turbine-driven boiler feed pumps at speeds of 5,500 rpm.

(*Continued on page* 222)

SUPERCRITICAL TEST BOILER at Sulzer Heat Lab is inspected by A. T. Hunter, left, Combustion Engineering, Inc; J. Gastpar and H. Wolfer, Sulzer Bros; and James Harlow, Philadelphia Electric Co

Heat Pump Market Is Opening Up

In ten years it is estimated that close to a million heat pumps will have been installed, and they will be selling at the rate of a quarter million per year

H. M. BRUNDAGE, General Manager, Weathertron Dept, General Electric Co, Bloomfield, N. J.

About two years from now the annual sale of heat pumps will begin a rapid increase that will raise the volume to near 75,000 units in 1960 and to 250,000 in 1964. That's the idea held by General Electric Co on how the heat pump market will develop. Many well-informed people think these figures are conservative.

Let's take a closer look at the future of this business. We believe that the packaged heat pump will, by far, outstrip any electric consuming device, except television, in growth acceleration, both in terms of numbers of installations, and more importantly, in added kilowatt-hours consumed. Such a volume pre-supposes a number of things—such as:

1. Decrease in the cost of the product of 50% or more.
2. A great deal of simplification of components.
3. Substantial increase in capacity.
4. Smaller physical dimensions of the unit.
5. More attractive exterior to emphasize to the purchaser the pride of ownership.
6. Much simpler and less expensive installation.

In addition, future heat pumps will definitely have better load characteristics than the ones currently made or envisioned. Reliability will have to be in the same order as a standard electric refrigerator, and mass production, of course, is one of the more important keys to lower manufacturing costs.

Our Estimate . . . We believe that there are today about 250 custom-built heat pumps installed, principally in large commercial installations, that there are 1,500 or more packaged units using water as their heat source and probably an additional 2,500 of the same type using air as a heat source. This makes a total of about 4,300 installations of which about 40% have been installed in the last 12 months.

This total on a national basis doesn't sound like very many, but looking forward to the next 12 months, there will be as many new heat pumps installed as are currently in operation.

In the year 1960 we estimate that nearly 75,000 new units will be installed and 200,000 will then be operating and consuming a total of over 2 billion kwhr per year. By 1964 we see installations being made at the rate of 240,000 per year and about 900,000 then installed and using around 9 billion kwhr per year, compared to only 300 million kwhr from today's installations, 30 times as much.

Higher Residential Usage . . . In the same period the average residential use of power will of course increase substantially. We estimate that the various forms of electric heating and air conditioning will account for 55 billion kwhr or 15% of the total residential load, as compared to 3 billion kwhr today. The heat pump will, of course, be a major contributor to this increased consumption.

Unfortunately, relatively few manufacturers are in this business today. There are a number of makers of water-source heat pumps and the equipment and components for custom-built installations, but only two major manufacturers are in the air-source business. The products of all these firms are highly satisfactory and giving good customer service.

Our marketing activities for the "Weathertron" were started in the South where year 'round air conditioning is most in demand. At present it is being handled by 44 distributors located in 22 states. Because of limitations of size and capacity, the markets to the present have been roughly limited to homes in the $20,000 to $40,000 class, plus, of course, a great and real opportunity in the commercial market. Out of the first thousand units installed, we found that 45% are in new residential construction, 15% in existing residential construction, and 40% of them are in the commercial market.

Commercial Market . . . The easiest and most vulnerable market is, of course, the commercial market because it has "economic" advantages which are easier to evaluate and sell than the residential field in which appeals are limited to comfort, safety, cleanliness, and convenience. Commercial installations have run the gamut of variety. We have installations in diners, churches, barges, airport signal towers, and in a large number of banks, stores, and offices, and multiple installations in factories and motels. A recent application is a shoe factory in Fredericksburg, Va., which uses 17 units in one building to cool and heat manufacturing and office areas.

One of the favorite pastimes of statisticians and sales managers is to estimate where their industries are going in the years to come. We are no exception to that rule. An accompanying graph indicates an upswing in unit sales which by 1961 we believe will reach an annual sales volume close to 100,000 units.

The upswing is not a mere figment of an over-enthusiastic imagination. Many changes in the product are planned to take place as the market grows—all of which improve the value-versus-price relationship. Of greatest significance in this respect is the reduction in installed cost in ratio to the total cost of the home or building. On the average this may run as high as 20% today—and must and will come down to 10% or lower as the volume increases, product is modified, and customer acceptance grows. This is not such a Herculean task. Installed costs of the General Electric unit dropped 15-25% during the first year of full scale marketing primarily due to increased product familiarity and know-how. Additional reductions are readily foreseen.

Get into the Mass Market . . . Another graph shows a cost comparison between the heat pump and the regular combustion-electric type residential air conditioning equipment. It is sound

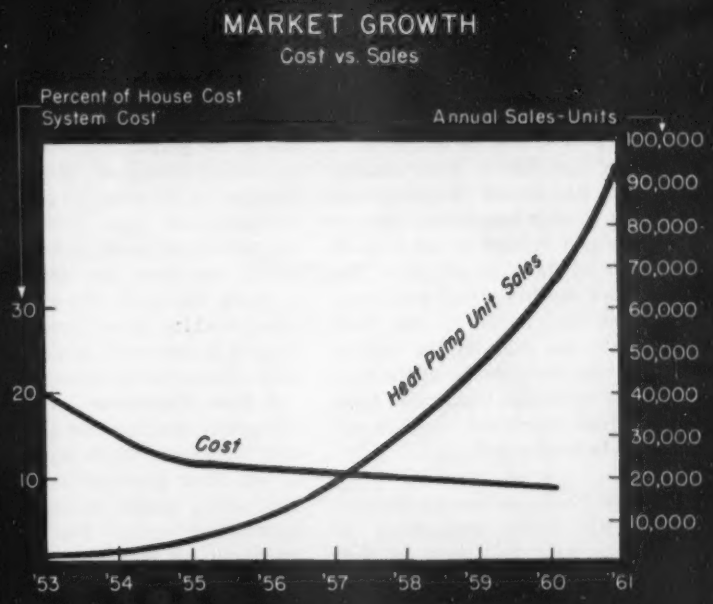
thinking to recognize lower prices not only in the heat pump equipment but also in the competitive combustion-electric type. On this graph are the cost trends for the two types of systems. The top of the shaded area is the dividing line between the luxury market and the mass market. As long as the price of the equipment is above the line, it is considered in the luxury market. When the price goes below, we then get into the mass market where the value-price relationship brings the product to an "accepted standard of living" level.

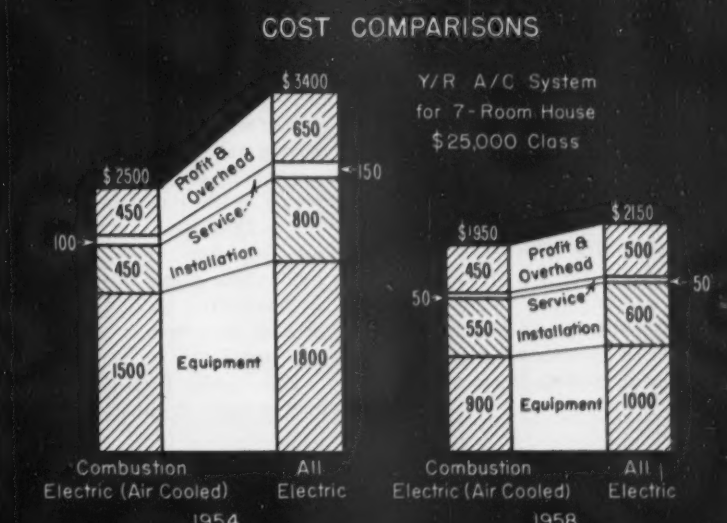
The crossover on the combustion-electric type of equipment is shown as of the middle of 1953, and we believe that by 1956 we will be into this mass market with heat pumps. In that year (1956) both types of equipment are shown in the mass market zone although the installed cost of the heat pump is still indicated to be slightly higher than that of conventional equipment. This, we believe, is quite logical since there are so many more advantages to all-electric heating and cooling with a heat pump system.

Cost Difference Will Lessen . . . A third graph gives a comparison of total installed costs, broken down by the major elements, for both a heat pump system and a combustion-electric system. Major reductions in cost of equipment and greater simplicity of installation result in a marked reduction in the cost difference between the two types of systems by 1958.

In case the reduction in total installed cost appears unrealistic, take a look at the history of other similar packaged products. One noteworthy example is the household refrigerator which in 1920 had an average price of $600 decreasing to $172 (a 71% reduction in 14 years as public acceptance of the product increased and the mass market was reached. A 50% reduction took place in the 5 year period from 1928-33). The same thing will happen with heat pumps, and the 1958 cost comparison is quite probable of attainment. In fact, a majority of the reductions necessary to reach this figure are in sight within the next two or three years.

Learn How to Sell . . . At this stage of marketing development, it is well that we all recognize three factors materially affecting its development. First of all, heat pumps are still hard to sell. While it is true that the public's





interest in the product is almost fantastic, it is also true that when this interest is matched against the prospect's ability to buy or his willingness to part with $2,500 or $3,500 for a complete installation, it is amazing how fast that interest disappears into thin air. Enough heat pumps have not yet been sold to learn all the tricks in the trade on "how" to sell them. The techniques are being improved every day, but the market is still quite limited by the price of the product and the size and capacity of the units currently available. Until these kinds of problems are solved, they are still going to be hard to sell.

Using the User . . . Second, we need testimonials badly—testimonials of users who have had them in their homes for one or two years, who have experienced the kind of air conditioning conditions that are created by Weathertrons and other heat pumps. True, GE has hundreds of such testimonials, but it is going to take thousands of them really to open up the market. In going back over our sales of units, in almost every case the purchaser has been interested because he knows someone who already had one and is highly pleased with its operation. In one small Southern town we installed five units in 2½ months, and all five sales were the result of one installation made almost a year and one-half earlier.

Third there is great need for figures on operating costs. We need to show prospects specifically what it costs to operate these units, and the costs cited must be for installations in the immediate neighborhood. We have a great number of these, but we are going to need thousands of them.

These three factors—first, that they are still hard to sell; second, that we need testimonials from users; and third, that we need transcripts of customers' accounts and proven operating costs in the local communities—are the reasons why we are so anxious, as are other manufacturers, to take advantage of every opportunity this year and next year to get a number of installations in every hamlet. Each of these installations will be the foundation of future growth. We can't wait until 1958 or 1960 to do it. It must be done now.

We and others in this industry see six serious problems which are challenging to manufacturers and to utilities:

1. Cost of Product . . . We are concerned with the cost of the product, not only today but where it is going to be in future years. As shown on one of the graphs, our projected goal in installed costs is only slightly higher than that of the projected cost of combustion-electric type equipment. We are making our plans accordingly, but it will take more than determination to reach this goal. We as manufacturers working alone cannot do it. It is going to take work at all levels and close cooperation of all concerned.

2. Sales Experience . . . We are continually amazed at the difference in sales techniques which are necessary to sell these products as compared with selling simple heating and air conditioning units. The kinds of representatives, their educational background, and business experience are much more vital in the sale of the $3,000 heat pump installation than in the case of a $375 oil burner or $250 gas furnace. These kinds of experience are not readily available. They must be found, educated, and developed as the product and its market develops.

3. Capacity . . . More sizes of units are required in the air-to-air fields. Engineering improvements in the design of the units will have to cut down the dimensions and give better air handling circuits within the unit so that the overall size can be reduced substantially. All development work must be done with one eye on the electric load characteristics of the complete installation so that at all times the equipment performance is improving in this respect.

4. Public Confidence . . . Naturally, as with most new products, public confidence rises very slowly. Concerted work by all interested parties—manufacturers, distributors, dealers, utilities, installers, service people—is needed to cultivate the public confidence which we all desire. We must have the endorsement, the wholehearted and unqualified endorsement, of the local utility. When a homeowner who has been in the habit of paying the utility company $3 to $5 per month decides to put in a heat pump, in which case his bill might be $15 to $25 a month, he will invariably ask the utility company what they think about it. He has personal confidence in them because they are local, because they have a great customer responsibility.

This inquiry from the homeowner may be made to almost any person in the utility company. He doesn't always call the president or the vice-president, sales manager or chief engineer. He may talk to the application clerk or someone behind the cashier's counter, a lineman or a neighbor for that matter. But he is certain to talk to someone in the utility business before making the investment. If he finds an enthusiastic and confident response to his inquiry, he is likely to go ahead. Without such endorsement the selling job is practically impossible.

5. Dealers . . . No matter how well the manufacturer designs the product, how much he advertises it, how much support and interest he gets from the utility companies, how much the architects and builders like it, how much the customer wants it, it still takes a person, and behind that person, a company locally to take the product to market. The problem of getting the proper kind of dealers and making them effective is one of the most serious of all.

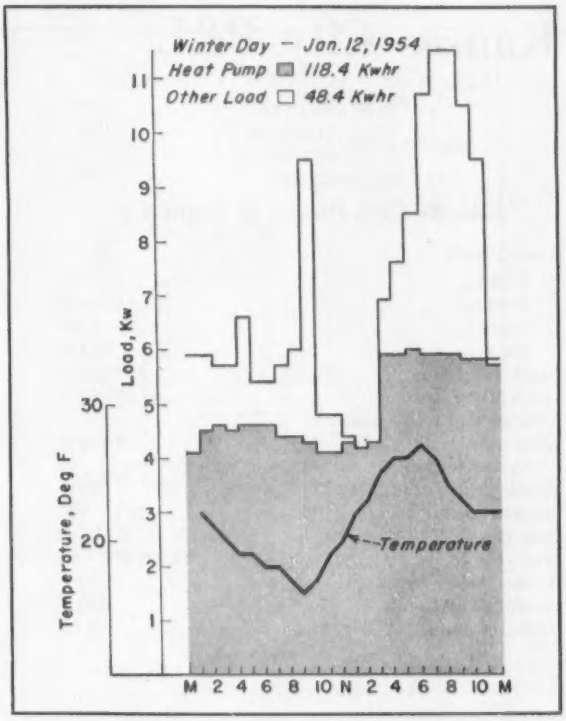
6. Utility Support . . . As of today, electric utility companies' support of the heat pump business runs the gamut from passive acquiescence to hearty cooperation. Actually there is no such thing as passive acquiescence. It is not possible for electric utilities to be neutral in their attitudes. If they are even close to the neutral stage, their attitude is interpreted as negative even though they may not wish it to be that way.

The major responsibility for the development of the heat pump business now lies with the electric utility industry. Because it is all-electric and new, it can't be sold "in spite" of the industry. It can only be sold "because of" the industry. The electric utilities hold the power of life or death over this potentially giant industry—lack of interest or enthusiasm will give it a sleeping pill for the next five or ten years. We, and other manufacturers, have done, are doing, and will do in the future our part to supply the products which are needed to profit customer, utility, and manufacturer. We will continue our contribution and investments in the future of this business in direct proportion to the will of the electric utility industry, as evidenced by their efforts today to promote the heat pump as the key to modern, all-electric living. The heat pump needs active, energetic, and vital stimulation and nourishment which it can get now only from the electric utility industry.

Atlantic City Electric

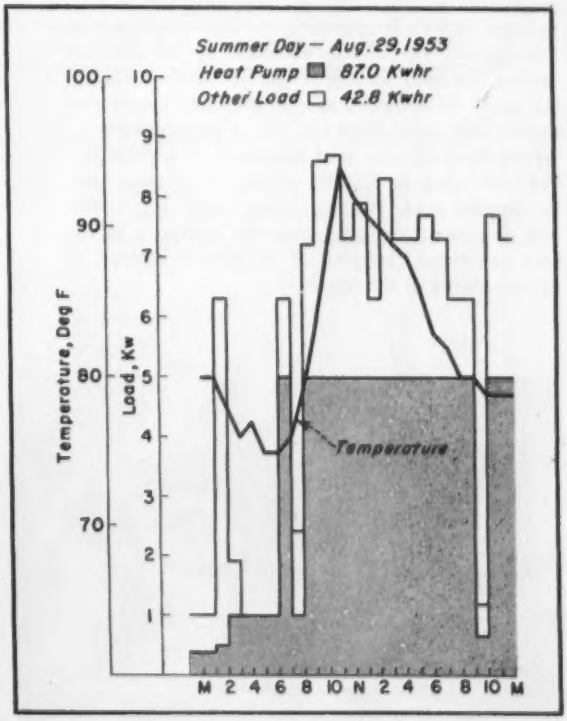
Atlantic City Electric Co

Annual Kwhr	
Cooling	3,510
Heating	11,072
Other	11,438
Total	26,020
Conditioned area	1,922 sq ft
Conditioned space	14,768 cu ft
Construction type—crawl space	
Glass area	341 sq ft
% double glass	100
Winter degree days	4,152
Summer cooling hours	600
Heat loss @ 10 F	49,000 BTU/hr
Heat gain @ 95 F	28,000 BTU/hr
Heating design temp	10 F
Cooling design temp	95 F
Rating of unit	5 hp



Optimum conditions for heat pump application are found in a completely electrified home in the comparatively equable climate of the Jersey coast. At least that is the indication to be taken from the graphs on this page. The winter day graph shows no or only a little use of supplementary heating, a large amount of heat being supplied by appliance uses.

The summer day graph shows cycling of the heat pump as it responds to the small drop in temperature in the early morning hours. Then as the day warms up and appliances come into use, the heat pump settles down to continuous operation until the evening cools a little, when the cycling begins again. And the difference in heat pump demand between warm summer day and cold winter day is easily covered by the load range of distribution transformer capacity.

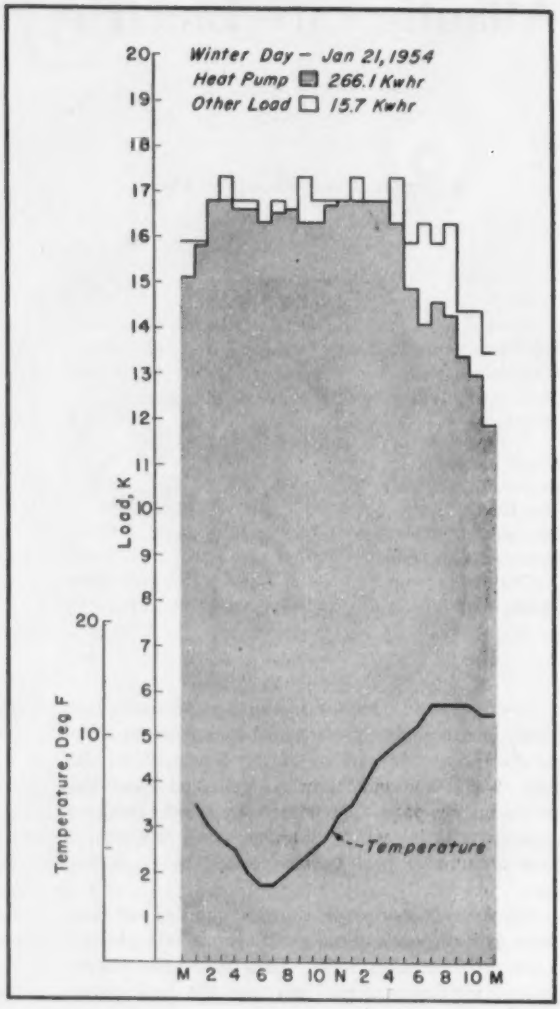


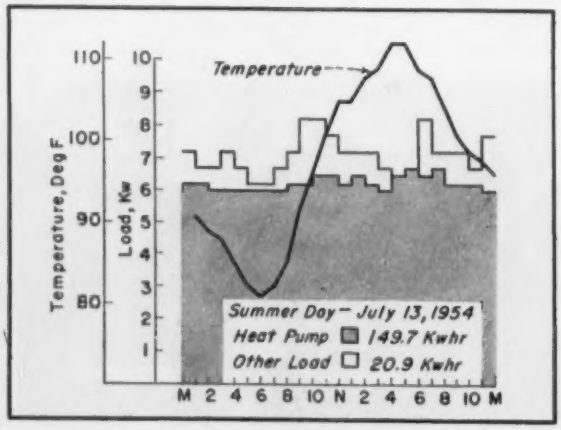
Kansas City P&L

Kansas City Power & Light Co

Annual Kwhr	
Cooling	7,591
Heating	17,614
Other	8,943
Total	34,148
Conditioned area	2,160 sq ft
Conditioned space	14,581 cu ft
Construction type—basement	
Glass area	248 sq ft
% double glass	50
Winter degree days	4,984
Summer cooling hours	900
Heat loss @ −10 F	76,027 BTU/hr
Heat gain @ 100 F	31,299 BTU/hr
Heating design temp	−10 F
Cooling design temp	100 F
Rating of unit	5 hp

Clearly shown by these two graphs is the wide range of temperature of the Great Plains region, from −3 deg F on the winter day graph to +112 on the summer day. The 5-hp heat pump of this installation is evidently not large enough by itself to cope with such extremes. On this winter day its full capacity output was exceeded by the auxiliary heating required to supplement it. And looking at the graph of summer day operation and considering the lag between outdoor and indoor temperatures, resulting from effective heat insulation, it appears that the heat pump more fully satisfies the cooling than the heating load. Neither graph shows any indication of other than fully automatic operation of the heat pump; no changing of thermostat settings by the occupants of the home.





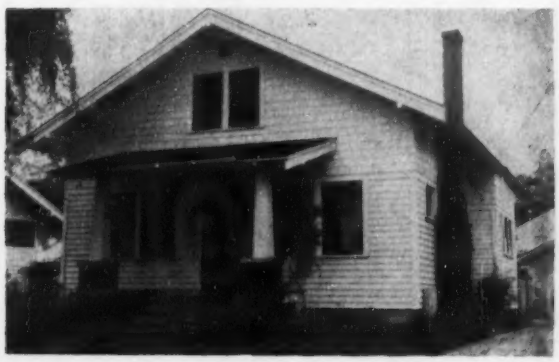
Pacific Power & Light

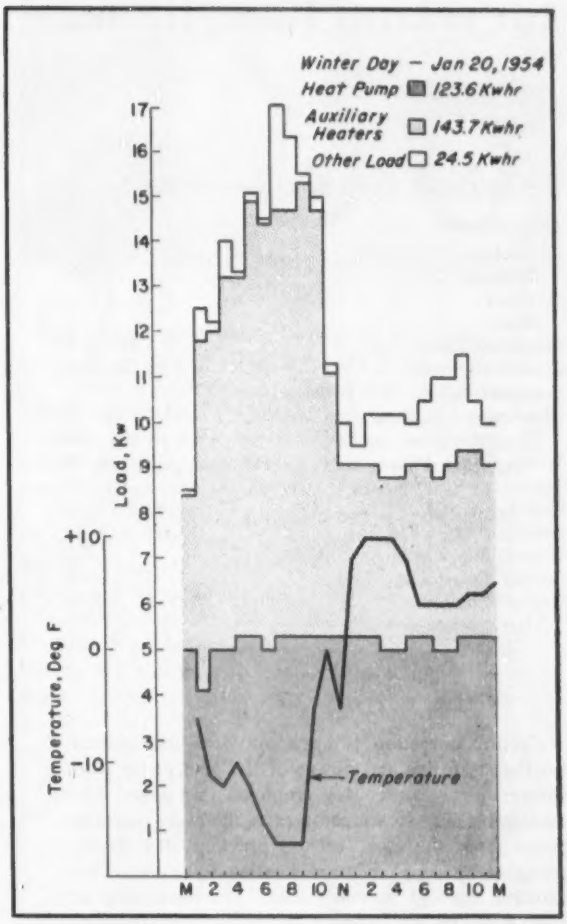
Pacific Power & Light Co

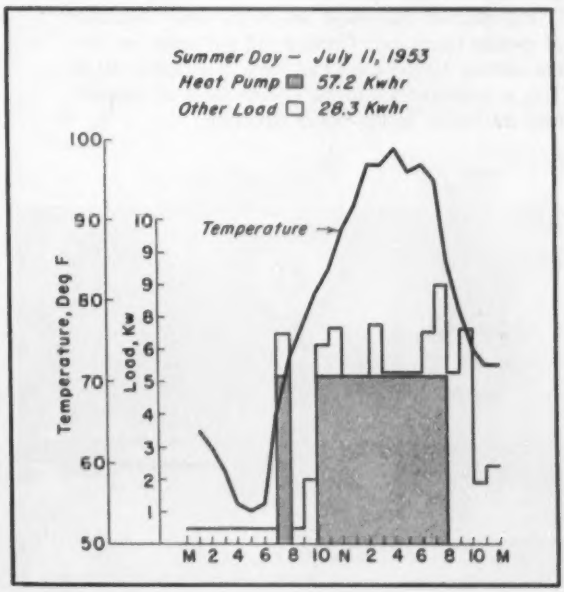
Annual Kwhr	
Cooling	1,400
Heating	11,240
Other	8,097
Total	20,737
Conditioned area	1,505 sq ft
Conditioned space	11,905 cu ft
Construction type—basement	
Glass area	170 sq ft
% double glass	9.5
Winter degree days	5,585
Summer cooling hours	264
Heat loss @ 0 F	59,300 BTU/hr
Heat gain @ 95 F	3,300 BTU/hr
Heating design temp	−10 F
Cooling design temp	95 F
Rating of unit	5 hp

Winter weather is pretty severe in Yakima, Wash., where is located the installation whose performance is shown in the graphs on this page. Compared with the Cleveland data, next page, these graphs indicate much less cycling of the heat pump with modulation of the supplementary heating.

The winter day graph shows the heating equipment closely following the changes in outdoor temperature, furnishing more heat as the temperature falls and reducing output as it rises. Although auxiliary heating is necessary in most heat pump installations in the northern part of the country, this is the only graph in the series here presented in which it is shown separately. The heat pump load in one morning hour on the summer day graph indicates heating operation which changed to cooling in a couple of hours as the temperature rose rapidly.







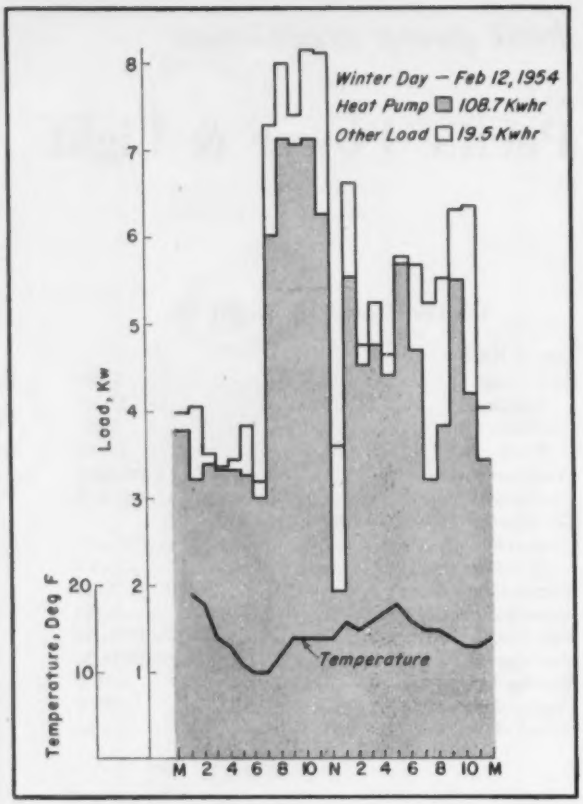
heat pump experience

Cleveland Elec. Illum.

Cleveland Electric Illuminating Co

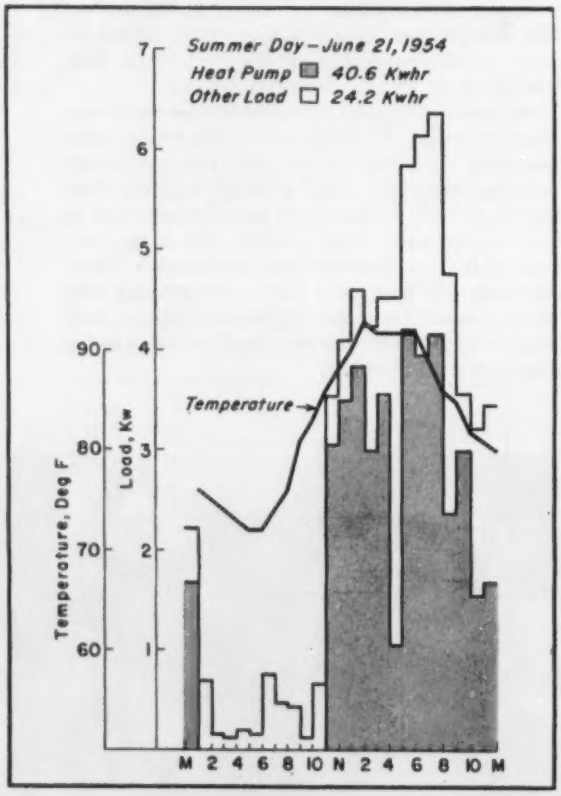
Annual Kwhr	
Cooling	1,012*
Heating	11,400*
Other	8,500*
Total	22,834
Conditioned area	1,100 sq ft
Conditioned space	8,800 cu ft
Construction type—full basement	
Glass area	150 sq ft
% double glass	100
Winter degree days	6,000
Summer cooling hours	450
Heat loss @ 0 F	50,000 BTU/hr
Heat gain @ 95 F	15,600 BTU/hr
Heating design temp	0 F
Cooling design temp	95 F
Rating of unit	3 hp

* Records incomplete.



Cycling operation is apparently the explanation for the steep ups and downs of the heat pump load shown on the winter day graph on this page. The continuing drop in temperature in the early morning hours from the level of the previous day finally brought the supplementary heating into use. This explains the high morning load. The deep drop at noon is due to cycling of the system when the thermostat was satisfied. This could be the result of usage of range or other appliances.

The summer day graph shows the same condition of cycling operation. Cooling did not come on until the outside temperature had risen well above 80 F. This is a testimonial to the effectiveness of adequate heat insulation in the house structure.



heat pump experience

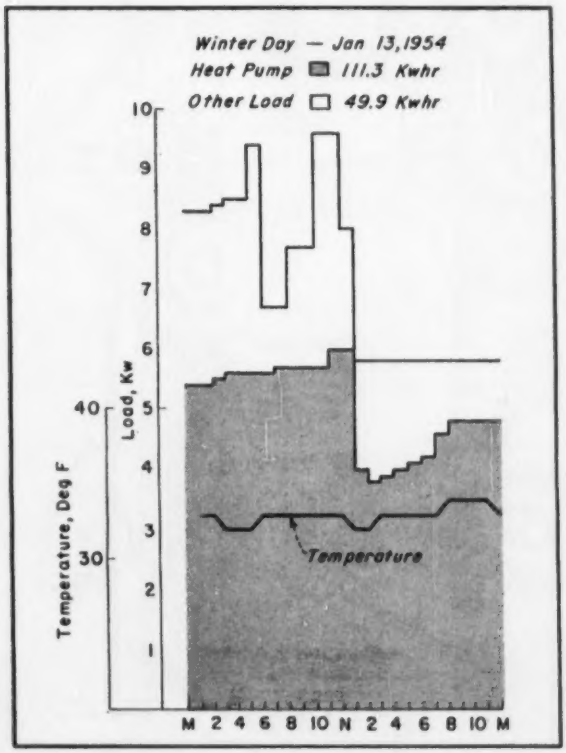
Dallas Power & Light

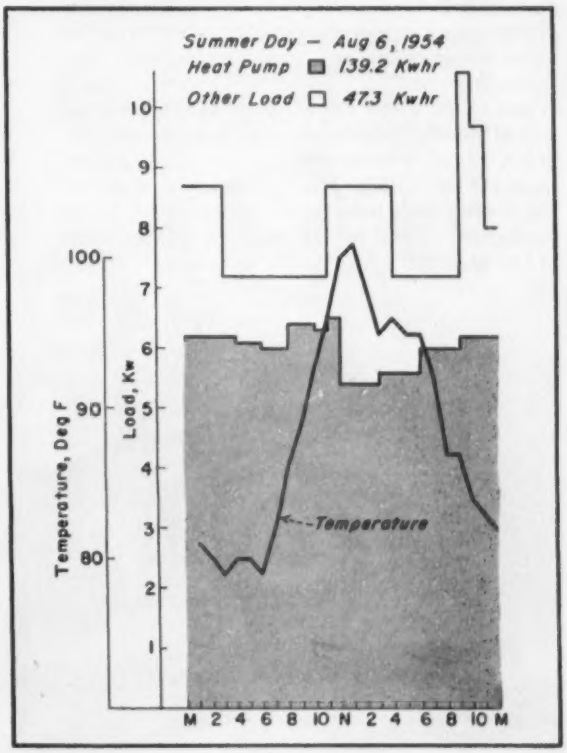
Dallas Power & Light Co

Annual Kwhr	
Cooling	12,533
Heating	9,416
Other	6,531
Total	28,480
Conditioned area	2,156 sq ft
Conditioned space	17,248 cu ft
Construction type—crawl space	
Glass area	562 sq ft
% double glass	0
Winter degree days	2,367
Summer cooling hours	1,400
Heat loss @ 0 F	102,807 BTU/hr
Heat gain @ 100 F	45,789 BTU/hr
Heating design temp	0 F
Cooling design temp	100 F
Rating of unit	5 hp

Because the heat pump both heats and cools, it is finding its first application in the South. This is shown clearly in the graphs on this page. On a cold winter day in Dallas with the temperature around freezing, the machine needs to call on no auxiliary heat to assure comfort. Over a third of the total heat required is contributed by other uses of electricity.

These other uses constitute a major part of the work of the heat pump in cooling the home, as is evident from the summer day graph. Here the machine is required to remove on this day some 180,000 or more BTU from the house in addition to those imposed by outdoor temperature. This is largely the reason why annual heat pump energy usage is about a third larger for cooling than for heating.





heat pump experience

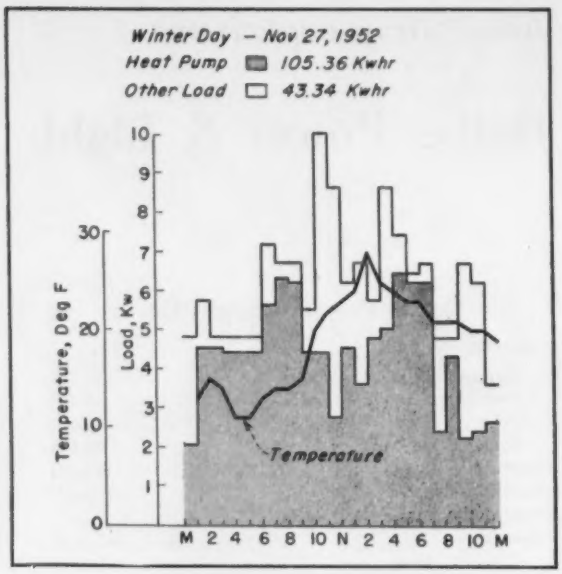
Utah Power & Light

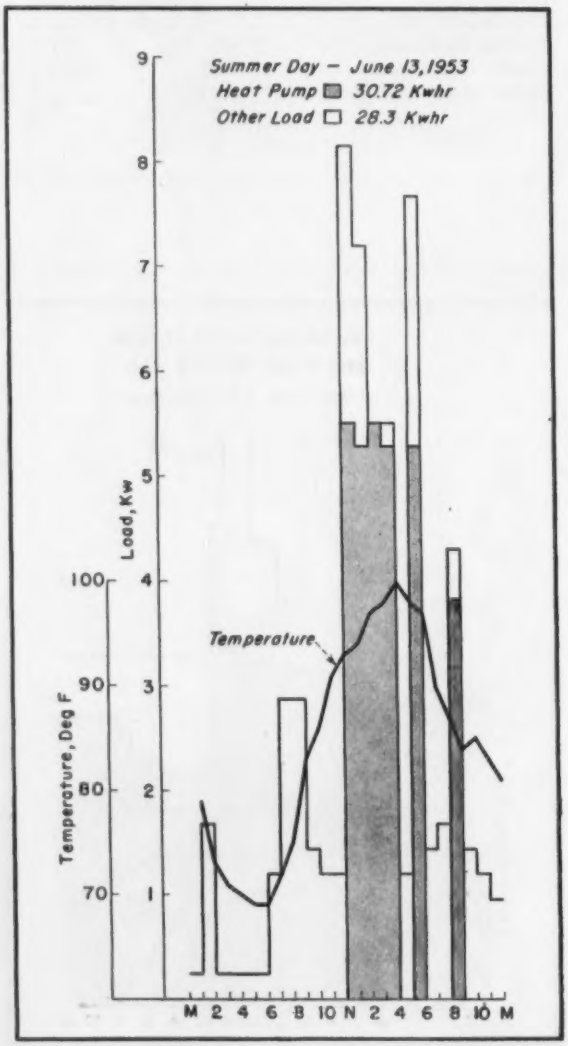
Utah Power & Light Co

Annual Kwhr	
Cooling	915
Heating	12,195
Other	6,270
Total	19,380
Conditioned area	1,400 sq ft
Conditioned space	10,350 cu ft
Construction type—basement	
Glass area	170 sq ft
Winter degree days	5,000
Summer cooling hours	600
Heat loss @ −5 F	80,000 BTU/hr
Heat gain @ 95 F	37,000 BTU/hr
Heating design temp	−5 F
Cooling design temp	95 F
Rating of unit	5 hp

Small use of auxiliary resistance heating is indicated on the winter day graph on this page of heat pump performance in a Salt Lake City residence. It was only during one week of the 1952-3 heating season, which includes the day covered by the graph, that auxiliary heating was required. The shape of the curve of heat pump energy usage conforms to the curve of temperature as it should in completely automatic operation.

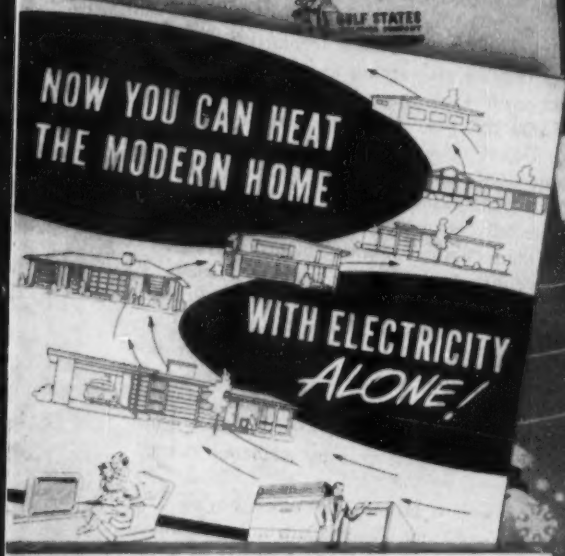
Just as the winter day graph presents a good picture of automatic operation, so does the summer day graph indicate non-automatic or manual. It appears quite clearly that the machine was not turned on for cooling until noon and was turned off in the evening, remaining out of use until the occupants of the house felt it was needed next day.

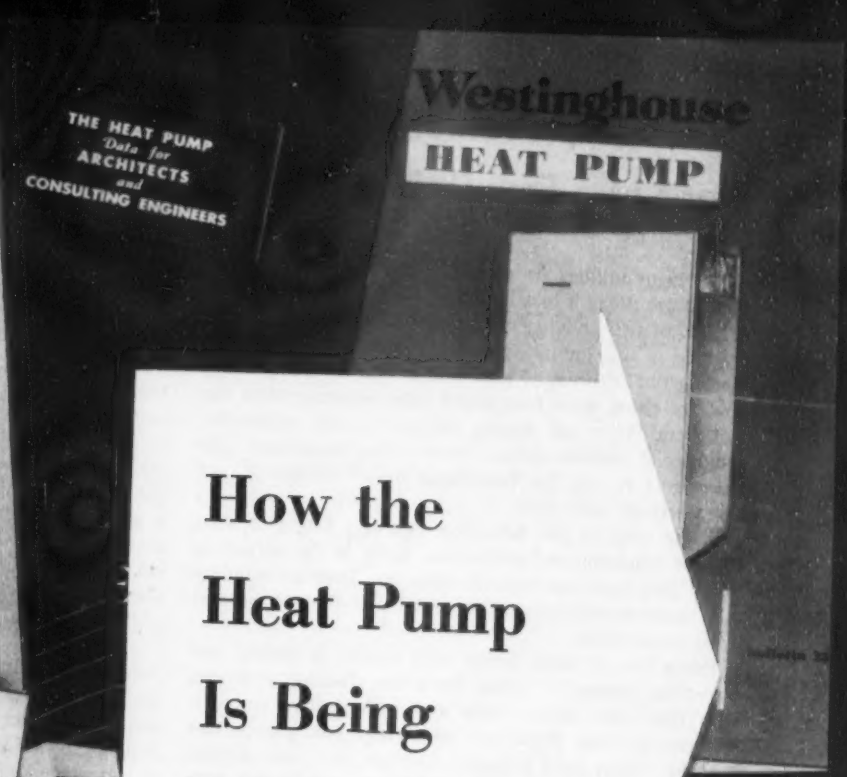




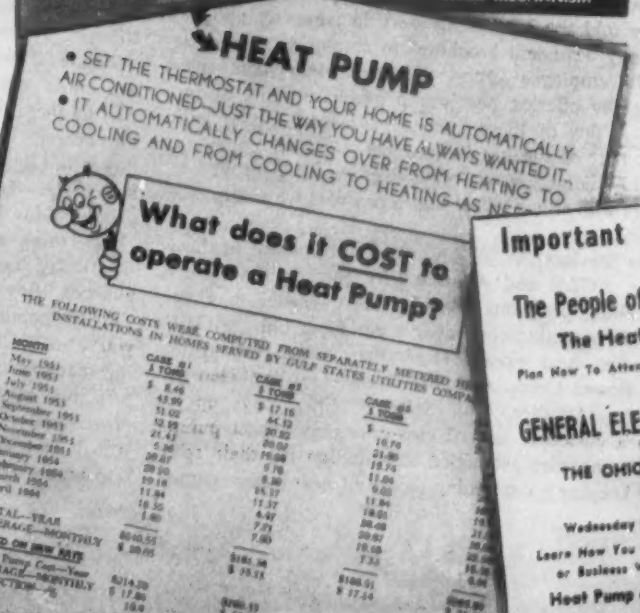
How the Heat Pump Is Being Promoted

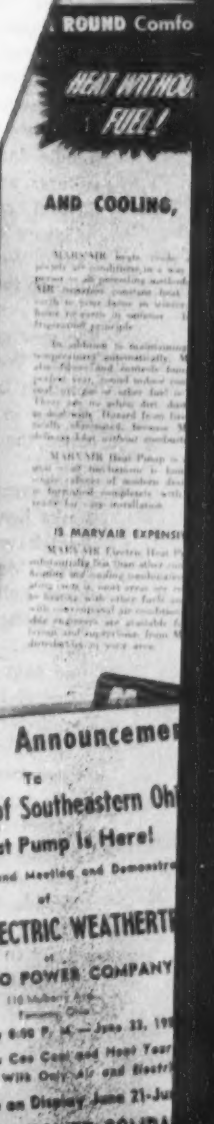
EMPLOYEE'S OFFER ON HEAT PUMPS
THE HOME COMFORT SYSTEM OF TOMORROW
for AUTOMATIC year 'round Air Conditioned Comfort
GULF STATES





All-Electric Cooling and Heating for homes, stores, offices
WEATHERTRON
USES NO WATER... BURNS NO FUEL... COMPLETELY AUTOMATIC
EFFICIENT MARVAIR MECHANISM


HEAT PUMP
• SET THE THERMOSTAT AND YOUR HOME IS AUTOMATICALLY AIR CONDITIONED—JUST THE WAY YOU HAVE ALWAYS WANTED IT.
• IT AUTOMATICALLY CHANGES OVER FROM HEATING TO COOLING AND FROM COOLING TO HEATING—AS NEE
What does it COST to operate a Heat Pump?
THE FOLLOWING COSTS WERE COMPUTED FROM SEPARATELY METERED HE INSTALLATIONS IN HOMES SERVED BY GULF STATES UTILITIES COMPA


ROUND Comfo
HEAT WITHOU FUEL!
AND COOLING,
IS MARVAIR EXPENSI
Important Announcemen
To
The People of Southeastern Ohi
The Heat Pump Is Here!
Plan Now To Attend Meeting and Demonstra
of
GENERAL ELECTRIC WEATHERT
at
THE OHIO POWER COMPANY
Wednesday 8:00 P. M. — June 23, 19
Learn How You Can Cool and Heat Your
or Business With Only Air and Electri
Heat Pump on Display June 21-Ju
THE OHIO POWER COMPA

Heat Pump Promotion: It's a Story of a Few Doing a Lot

Not many utilities are promoting the heat pump. Those that do are doing it in a big way.

Most of this activity, with a few notable exceptions, is centered in the South. These utilities, after a preliminary "feeling out" process of load studies and market probing, now are going after heat pump sales wherever they can find them. They are digging into every field: residential, commercial and industrial. Mass selling techniques, like those used to sell the established major appliances, are being brought into play.

In the table on the following page is a listing of what 17 heat pump-minded utilities are doing in the pursuit of sales. They have one thing in common. They are building their ventures into this field on a solid base of employee and trade cooperation.

Every one of them works with dealers in finding and screening prospects. Most carry on training programs with their own sales people and with dealers and distributors to show them how and where heat pumps can be sold. Many hold periodic meetings over their service areas, some with architects and builders only, others with the general public.

Fourteen of the 17 companies have one or more specialists who spend full time in promotional work. These specialists keep in close touch with the building industry, handle dealer and customer contacts, act as engineer consultants, and stage heat pump meetings and demonstrations. Several companies also issue periodic sales bulletins.

Says a spokesman for American Gas & Electric Service Corp: "We attempt to follow every possible lead that might develop into a heat pump installation. This includes checking the commercial and residential building permits issued for new construction to find possible heat pump applications. We particularly give attention to architects and builders in each area. This gives us the opportunity of getting in on the ground floor on a more selective basis when the interest of the professional service is secured."

Employees . . . Utilities' efforts to make their own employee ranks heat pump conscious vary widely. All of them at least have told the heat pump story in company publications. Many have sent brochures to employees' homes or have held employee group meetings. Five companies go further by offering heat pump purchase plans to employees. A few of these finance payments, and at least one pays part of the installation cost. Another company, Central Louisiana Electric, pays a commission of $25 to employees who either sell or find a prospect who buys one.

Customer Services . . . As an added convenience to those who buy, AG&E and Atlantic City Electric Co feature budget billing programs whereby the customer may apportion his operating costs over a period of time. AG&E also services heat pumps after their installation as do Florida Power Corp, Alabama Power Co, and Georgia Power Co. Another, Gulf States Utilities, pays up to $300 to a customer toward cost of wiring a heat pump.

Most companies get added ammunition for their sales guns by keeping a continuing record of heat pump operating costs. Some of them do this by submetering. Gulf States Utilities prints cost data from selected installations on pocket-size cards and distributes them to prospects.

As with any product that is just getting its feet wet in the market, the heat pump relies heavily on "show it to 'em" techniques. As a result most utilities center their advertising on displays and demonstrations, and many are now expanding to newspapers and direct mail pieces. Always and everywhere the heat pump's year-round cooling and heating benefits are stressed.

Displays, Exhibits . . . All but three utilities have displayed units in their show windows or on their office floors—some on a one-shot basis, others in a continuing program. Another widespread practice is to install heat pumps in company buildings. This provides a permanent display and a good vehicle for publicity. Some have installed them in model homes or exhibited them at fairs, home shows, etc. Two companies, Arkansas Power & Light and Kansas Gas & Electric, have put traveling displays on road tours of their systems (EW, Sept. 13, p 46).

Newspapers, Direct Mail . . . In order to reach still wider audiences, many utilities are turning to newspaper advertising and direct mail. Gulf States Utilities, for instance, will spend $25,000 this year for heat pump advertising in newspapers. Direct mail pieces are usually produced by the company itself, and sometimes supplied by the manufacturer. In most cases they are sent to architects, builders, and selected lists of prospects. Newspaper advertising varies from simple announcements of demonstrations and meetings to elaborate campaigns such as those developed by Atlantic City Electric, Georgia Power, and Public Service of Oklahoma. User testimonials, regarded as one of the most effective heat pump sales devices, are employed by four companies. Many dealers and distributors also are putting testimonials to work in their sales appeals. Still another medium—the outdoor billboard—has been used the past year by Alabama Power.

Outcome . . . How well is promotional effort paying off? Here are some results: Florida Power Corp now has more than 400 units in operation and looks forward to what it calls tremendous increases in the years ahead. Alabama Power has at least 165 in service; Carolina Power & Light Co (not listed in the table but an active promoter nevertheless) has 56; Georgia Power, 62; Gulf States Utilities, 105.

Besides those listed there are other utilities who more and more are getting aboard the heat pump wagon. Among them: Kansas City Power & Light, Potomac Electric Power, Union Electric Co of Missouri, Mississippi Power & Light, Salt River Project of Phoenix, Ariz., Oklahoma Gas & Electric, Georgia Power & Light, South Carolina Gas & Electric, and several of the Texas utilities.

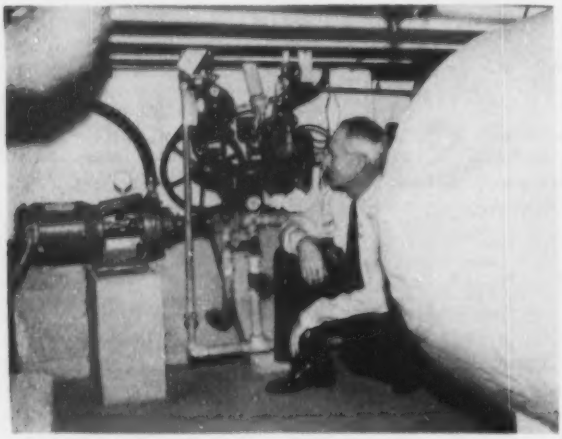
One thing is evident. The heat pump can and is being sold today just like any of the other accepted major appliances. But it differs from them in one important way: Climatic conditions affect its load characteristics. Whether you're in Chillicothe or Chino electricity used by a washing machine or range will give about the same load picture, not so with the heat pump. And until each utility "feels out" or acquaints itself with how the heat pump will fit into its particular load pattern, heat pump promotion across the country will continue to be spotty.

Utilities Are Doing These Things to Sell Heat Pumps

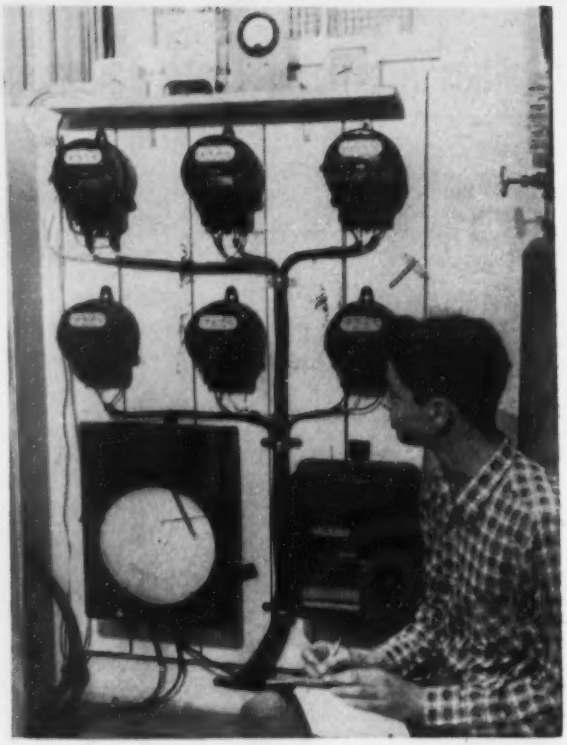
PROMOTIONAL ACTIVITIES	REPORTING UTILITIES																
	Ala. Power Co.	Amer. G.&E. System	Ariz. P.S. Co.	Ark. P.&L. Co.	Atl. City Elec.	Cen. La. Elec. Co.	Cen. P.&L. Co.	Fla. Power Corp.	Ga. Power Co.	Gulf Sts. Util.	Ken. G.&E. Co.	L.A. Dept. of W.&P.	P.S. of Okla.	Pac. Gas & Elec.	Sac-mnto MUD	San Diego G.&E.	So. Cal. Edison
Continuous Industry Contacts with Architects, Bldrs. etc.	•	•	•		•		•	•	•	•	•	•	•		•		•
Local, Industry Meetings with Architects, Bldrs, etc.	•	•	•		•		•	•	•	•	•			•	•		
Heat Pump Specialists	•	•	•	•	•		•	•	•	•			•	•	•	•	•
Cooperation with Dealers (obtaining & evaluating prospects, etc.)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Regular Reports on Heat Pump Sales Activities	•	•	•		•			•	•	•				•			
Sales Training	•	•	•	•	•		•	•	•	•	•		•	•	•	•	•
Inform Employees	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Employee Commissions for Leads						•											
Employee Purchase Plans		•	•			•				•	•						
Subsidize Installation										•							
Keep Records of Operating Costs	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•
Service Heat Pumps	•	•						•	•								
Budget Billing		•			•												
Sub- Metering for Heat Pump Operating Records	•	•	•	•	•	•	•	•	•	•	•		•	•	•		•
Floor and Window Displays	•	•	•	•	•		•	•	•	•	•	•	•	•	•		
Newspaper Advertising	•	•	•	•	•	•	•	•	•	•			•		•		
Direct Mail	•	•			•	•		•	•	•							•
Use in Co. Buildings	•	•	•	•	•	•	•	•	•	•		•	•	•	•		•
User Testimonials		•			•			•							•		
Model Homes, Home Shows, etc.	•	•	•		•		•			•		•	•				•
Traveling Displays (trailers, etc.)				•							•						

This check list was compiled from the best information at hand on October 21. Some of the utilities names may find their activities incompletely or erroneously checked on a few items. Also, the list is not inclusive; there are probably some utilities promoting the heat pump whose names are not included. Electrical World will be pleased to learn of erro.s or deficiencies in this check list noted by readers and will publish a revision of the list if the volume of corrections and additions received justify doing so. Cooperation of the utilities listed above in supplying material for this table is gratefully acknowledged.

HOME, near Madison, is a two-story frame structure. Floor area is about 1,600 sq ft, and volume is 13,000 cu ft. House is insulated



MOTOR-DRIVEN PUMP, left, forces 51F water into heat pump cycle. Heat is stored in 317-gal tank at right. Author inspects equipment



METERS were installed to gather information on the operation of the equipment. Readings are being taken by Glydewell Burdick, Jr

Heat Pump Utilizes Heat Storage

GLYDEWELL BURDICK, Secretary, Wisconsin Power & Light Co, Madison, Wis.

Heat pump operation in my home, near Madison, Wis. proved highly satisfactory during the winter of 1953-54. Temperature was maintained at 75F, day and night, throughout the heating season. For Madison usual design temperature is 15F, and there are about 7,400 degree days annually.

The heat pump system was largely my own personal project, at my own expense. Numerous meters were installed to gather information on the operation of the equipment. The meters and instruments were made available by Wisconsin Power & Light Co and Madison Gas & Electric Co; the latter supplies electricity in the area. Meters were read daily during much of the winter.

Features . . . Several features have contributed to the success of this installation:

1. Heat transfers: well water, to gas, to circulating water, to house air.

2. Storage of heat in a 317-gal insulated tank.

3. Control of tank temperature and compressor operation by an outdoor-reset thermostat, which varies the circulating water temperature with the outdoor temperature and wind velocity, and thus with the heat loss of the house.

4. Dual-rate heat distribution and ventilating system employing two small circulating pumps between storage tank and air coil, and 2-speed blower, all under control of room thermostats.

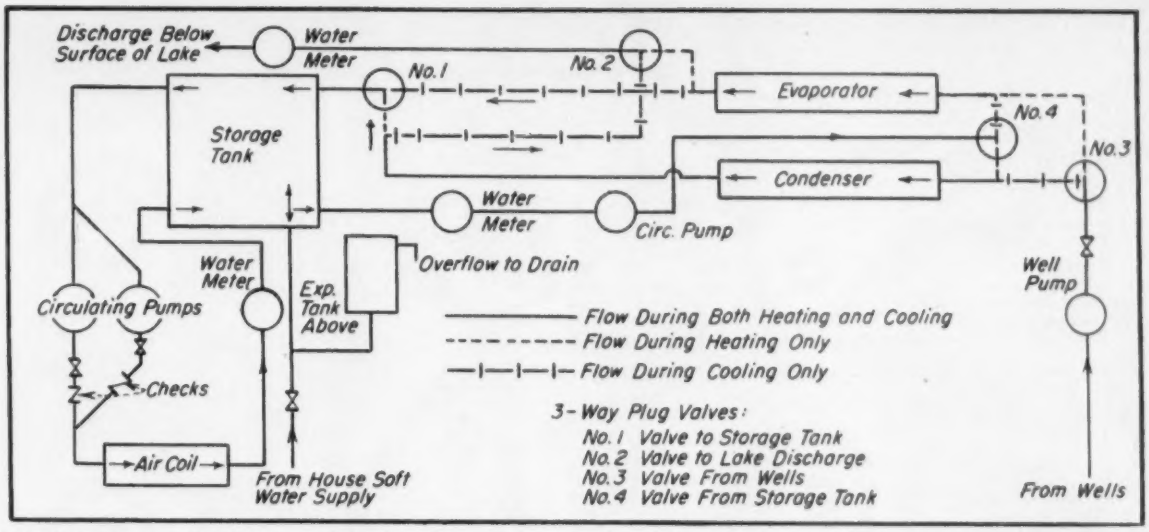
Performance . . . The combination of the above features made possible the highly satisfactory performance of this heat pump, under our generally unfavorable and frequently severe Wisconsin conditions.

The storage tank and control of compressor operation independent of room thermostat permits long and infrequent compressor operating cycles, reducing wear, improving efficiency, and minimizing the importance of voltage fluctuation upon starting. The maximum number of cycles may be held to no more than 15 per day, and in weather averaging around freezing ran about 9 per day.

Varying the control point of tank temperature with the weather automatically operates the compressor at low head pressures most of the heating season and requires higher head pressures only in the colder weather. The result is a low average head pressure, improved coefficient of performance, and presumably longer life for the equipment.

A high degree of heating comfort is realized through continuous warming and circulation of air, to meet a heat loss in advance rather than to make it up after it has occurred. The "cold 70" problem of the common automatic warm-air system is avoided.

With variation of tank temperature with the weather and constant operation of the small circulating pump and



FLOW OF WATER AND HEAT through Burdick's heat pump system is shown in the piping diagram. Note location of two circulating pumps

Table I–Ratios to Compare Operation During Different Periods and Conditions

Period	65F Base Avg Degree-Days per day	70F Base* Degree-Days for Period	Kwhr per Degree-Day, 70F Base* Collection & Storage	Distribution	Avg Compressor-hrs per cycle	Ratio Condenser Water to Air Coil Water	Well Water Avg efh	Compressor Avg Watts
Oct. 1- 7, '53...	10.3	97	0.99	0.24	—	0.22	189	4,780
Oct. 8-14.....	9.9	104	0.92	0.23	—	0.20	197	4,680
Oct. 15-22.....	1.1	32	1.30	0.38	0.26	—	—	
Oct. 23-31.....	19.2	218	0.80	0.17	—	0.43	164	4,530
Nov. 1-10.....	24.5	294	0.88	0.21	0.27	0.89	198	4,560
Nov. 11-17.....	16.9	152	0.84	0.25	—	0.99	—	4,380
Nov. 18-31.....	28.3	437	0.83	0.20	—	0.97	163	4,380
Dec. 1-10.....	29.0	340	0.82	0.22	0.44	1.27	183	4,520
Dec. 11-20.....	43.0	470	0.91	0.17	0.72	1.64	175	4,630
Dec. 21-31.....	39.0	475	1.01	0.18	0.54	1.52	180	4,650
Jan. 1-10, '54...	36.5	415	0.94	0.18	0.40	1.37	174	4,598
Jan. 11-20.....	53.4	584	0.92	0.13	0.61	1.43	173	4,760
Jan. 21-30.....	46.5	567	0.87	0.16	0.47	1.49	171	4,649
Feb. 1-15.....	34.1	587	0.89	0.19	0.36	1.43	174	4,624
Feb. 16-28.....	29.4	448	0.88	0.20	0.37	1.44	174	4,566
Mar. 1-10.....	36.4	414	0.99	0.19	0.63	1.51	173	4,656
Mar. 11-20.....	32.8	378	0.87	0.18	0.52	1.41	175	4,628
Mar. 21-31.....	31.1	397	0.75	0.19	0.57	1.21	176	4,555
Apr. 1-10.....	23.4	284	0.89	0.23	0.59	1.12	176	4,560
Apr. 11-20.....	11.7	167	0.84	0.22	0.57	1.21	174	4,510
Apr. 21-30.....	10.7	156	0.82	0.21	0.57	1.17	176	4,530

Evaporator chlorinated on March 14 and April 10.

* Degree-days on 70F base used for this purpose because with room temperature controlled at 75F, DD on 65F base is a poor measure of heat loss of house in mild weather as compared with colder weather

low-speed on the blower, heat usually is added continuously to room air at a rate only slightly below the time-to-time heat loss of the house. This also provides good heat distribution and prevents stratification of the air. The remaining heat requirement is made up by the larger pump and high speed on the blower, controlled by the second stage of the room thermostat. As compressor operation is not affected, the differential of the room thermostat may be set very close for maximum comfort; and the result is nearly "perfect circle" charts showing almost no variation of room temperature.

With heat distribution by low-temperature air, the air has a somewhat different "feel" from air in the house heated by the usual warm-air fuel burning system. It is a spring-like feeling. Air outlet temperatures range from as low as 80F in very mild weather to about 105F at 15 below zero.

With our high-wall outlets, these low duct temperatures were entirely satisfactory and indeed pleasant. The changes from blower low-speed to blower high-speed are hardly noticeable; whereas upon trial the abrupt change from no air movement to blower high-speed, unavoidable in a single-stage system, was definitely objectionable.

Operating Results . . . Performance data under different conditions are shown in Tables I and II. The aver-

Table II–Report of Operation of Heat Pump

	February 1954	March 1-10	March 11-20	March 21-31	Oct. 1, 1953 to March 31, 1954	Jan. 17, 1954 (Coldest day)
Degree-days (Truax Field)	895	364	328	342	5,527	68
Avg per day in period	32.0	36.4	32.8	31.1	30.3	68
Avg wind velocity	11.3	13.1	14.3	11.3	———	9.1
Heat collection and storage kwhr:						
Well pump	79	34.25	26.75	25.00	477	5.6
Compressor	786	351.75	282.45	256.00	4,921	64.2
Circ pump to tank	52	23.00	18.80	18.00	323	3.8
Total	917	409.00	328.00	299.00	5,721	73.6
Total per degree-day	1.02	1.12	1.00	0.87	1.035	1.08
Heat distribution and ventilation kwhr:						
Pumps to air coil	67	26.3	23.6	25.6	406.5	2.9
Blower	136	50.4	45.2	48.6	772.2	5.4
Total	203	76.7	68.8	74.2	1,178.7	8.3
Total per degree-day	0.23	0.21	0.21	0.22	0.213	0.12
Total heating system kwhr	1,120	485.7	396.8	373.2	6,899.7	81.9
Per degree-day	1.25	1.33	1.21	1.09	1.248	1.20
Water handled (cubic feet)						
From wells	29,910	13,106	10,679	9,915	190,704	16,800
Circ to storage tank	17,179	7,570	6,112	5,616	107,857	9,855
Circ to air coil	11,932	4,991	4,340	4,649	100,180	———
Avg cfh from wells	174	173	175	176.4	174	———
Avg cfh to storage tank	99.97	99.95	99.93	99.93	100.25	———
Avg cu ft/day to air coil	427	499	434	422	550	———
Average watts input:						
Well pump	460	452	437	445	434	———
Compressor	4,595	4,656	4,628	4,555	4,614	4,912
Circ pump to tank	303	304	307	320	300	———
Small pump to coil	105	106	105	106	———	———
Large pump to coil	187	191	187	———	———	———
Blower—low speed	194	201	200	201	———	———
Blower—high speed	379	391	390	———	———	———
Operating time—hours:						
Compressor	171.07	75.54	61.03	56.20	1,066.54	13.07
Circ pump to tank	171.85	75.74	61.16	56.20	1,075.85	13.07
Blower—low speed	554.61	206	202	242	———	15.13
Blower—high speed	62.75	23	12.3	———	———	8.60
Avg compressor cycles per day	16.7	12.3	11.8	9.0	———	———
Avg hr operation per cycle	0.37	0.63	0.52	0.57	———	———

Table III–Results of Coefficient of Performance Test

Date	Water out Temp Deg F	Head Press psig	Suction Press psig	Coefficient of Performance Compressor only	Coefficient of Performance Inc. well pump & circ. pump
Jan. 16, '54	105	147	32.5	3.86	3.49
Jan. 20	94.4	128	32	4.35	3.86
Feb. 13	99.3	.....	.....	4.11	3.64
Feb. 21	88	115	.....	4.44	3.94
Mar. 4	98.2	135	.....	4.17	3.75
Mar. 14	96.4	132	32.5	4.37	3.92
Mar. 20	87	112	33	4.61	4.11

The expansion valve was changed from a 5-ton to a 6.5-ton size on Feb. 13.
The evaporator was first chlorinated on March 14.

age kilowatt hours per degree-day, 65 base, for heat collection and storage were 1.035. Kilowatt hours per degree-day for heat distribution were 0.213, and total power for the system was 1.248 kwhr per degree-day, some of which is chargeable to comfort ventilation rather than heating necessity. In our all-electric home about 20% of the total heat requirement for the period was contributed by the general usage of electric energy for purposes other than operation of the heating system.

Results of coefficient of performance tests are shown in Table III.

Cooling . . . Little information is available at this time on cooling as the unit operated on the cooling cycle only one week late in August 1953. However, based on that week's performance, there is obviously cooling capacity to spare.

The Heated Space . . . Our home is a two-story frame structure. Floor area is approximately 1,600 sq ft, excluding unheated closets. About 1,000 sq ft of the area is on the first floor. Volume is approximately 13,000 cu ft. The house is located on low land on the north shore of Lake Mendota, directly across from Madison.

All windows have storm windows except two have thermopanes. The pair of French doors opening from the living room to the open porch facing the lake are single-glass without storm doors. All walls and the exposure ceilings are insulated with 2 in. and 4 in. of fiberglass and rockwool blanket and some loose-fill rockwool.

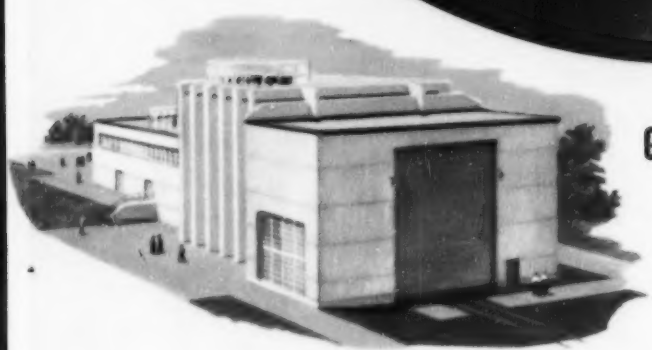
Calculated heat loss was 66,000 Btu/hr at −20F and 15 mph wind. Calculations during severe days last winter indicate that 60,000 Btu/hr

(*Continued on page* 220)

LISTEN . . . to a new weapon in the fight against transformer noise

PLAY this *actual record* on any 78 rpm record player

Tear along perforated line



G.E. tunes you in on a power transformer in the

WORLD'S LARGEST SOUND LABORATORY

for the full story, see inside

GENERAL ELECTRIC

How the new G-E Sound Lab is helping to SOLVE TRANSFORMER NOISE PROBLEMS

The first of its kind devoted solely to the accurate, searching investigation of the sources of transformer noise, General Electric's new Sound Laboratory is already helping to solve transformer noise problems.

Built at Pittsfield, Massachusetts – the center of G.E.'s power transformer research and manufacturing facilities – the new sound laboratory has walls nearly 5 feet thick. How quiet is it inside? The ambient sound level (20 db) represents less than one-millionth of the sound energy you would normally receive as you walk along a busy street. In the awesome silence of the laboratory, microphones and amplifying equipment – sensitive to a mere whisper – detect and measure every characteristic of transformer noise.

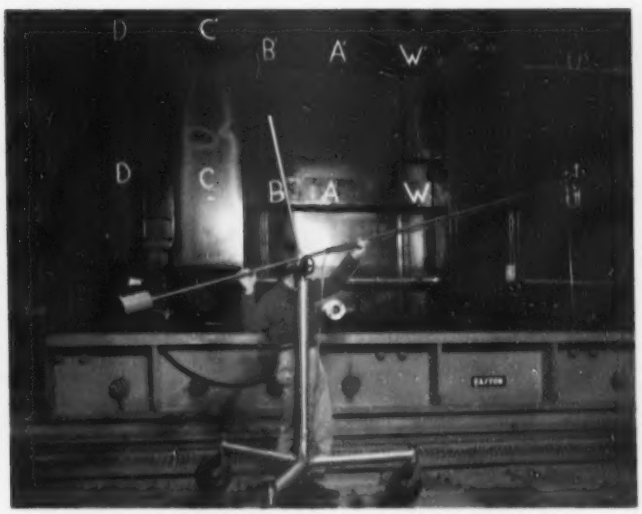
Quieter transformers at lower cost. To make certain that your transformers meet sound level specifications, one of the important jobs of the new laboratory is the precise measurement of the noise levels of power transformers embodying experimental construction and processes. These measurements, accurate to a fraction of a decibel, make possible immediate recognition of the individual small improvements which add up to major progress... and help to bring you quieter transformers at lower cost.

New techniques solve noise problems. Since the ear is more sensitive to certain kinds of noise, complete frequency analyses are being conducted in the new laboratory to pin-point the sources of these irritating vibrations. In other investigations, dynamically-scaled models are used to predict the sound levels of transformers still in the design stage. These acoustic models also help determine the value of barriers and enclosures as aids to noise reduction of transformers in service.

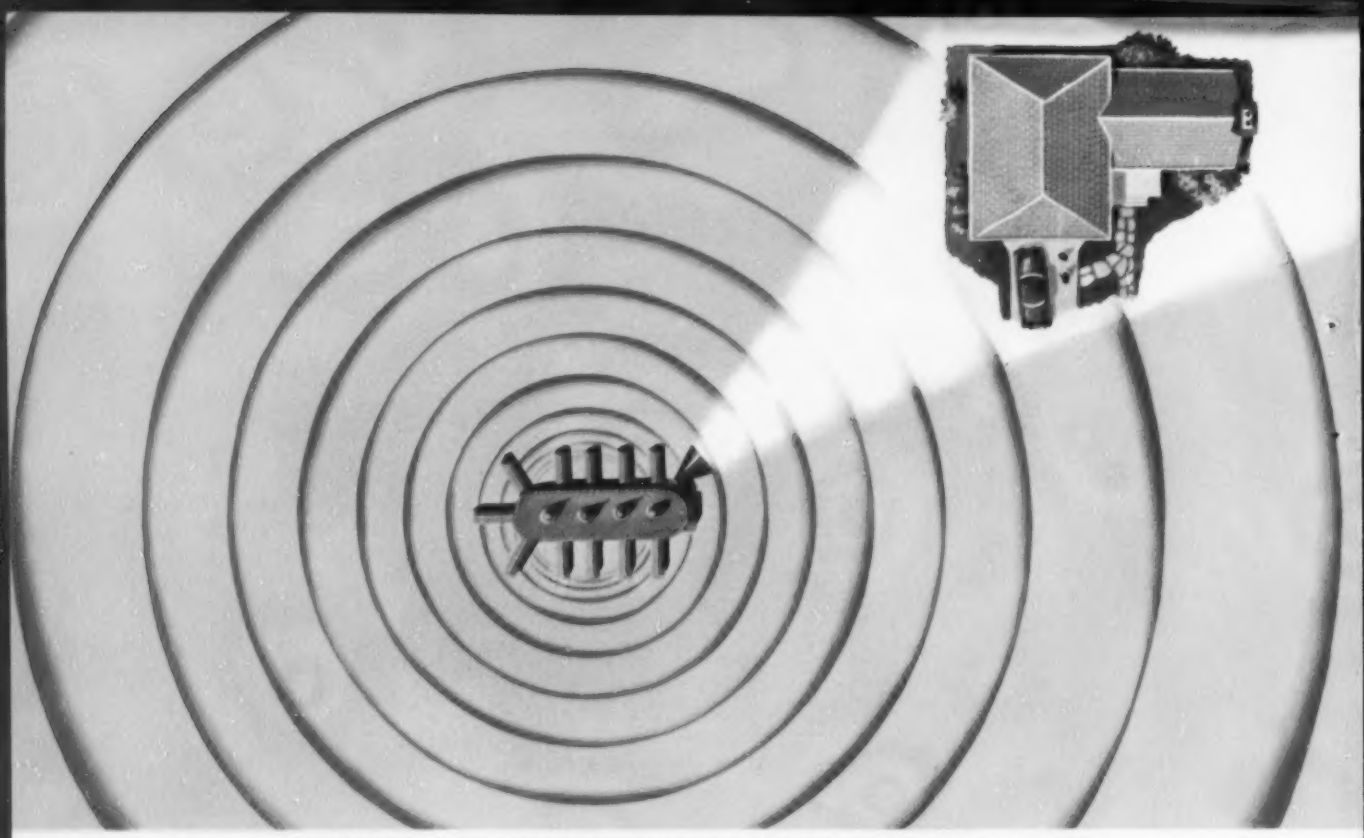
The answers to what to do about noisy transformers in service may take many forms. For example, General Electric engineers have found that one way to hush a power transformer is to *add* a sound source. This apparent paradox is explained on the next page.

GENERAL ELECTRIC

ACOUSTIC MODEL is used to predict the noise level of a transformer still in the design stage and also to check the effectiveness of a sound reduction barrier.



FULL-SIZE TRANSFORMER rated 133,000 kva is given a noise test. Decibel levels are recorded at three-foot intervals around the tank.



LOUDSPEAKER ON TRANSFORMER BEAMS "CONE OF SILENCE" TOWARD NEARBY HOME.

SOUND CANCELLATION . . . a new twist that offers a promising solution for noise problems at transformer installations

FIELD TESTS prove that "Sound Cancellation" is practicable. With loudspeaker turned on, sound level here is substantially lower because the sound waves have cancelled out each other.

Already, the new General Electric Sound Laboratory is contributing to the fight against transformer noise. A new twist on an old idea called "Sound Cancellation" has been worked out in the laboratory. It will help to cure a specific noise complaint under certain conditions by beaming a "cone of silence" away from the transformer.

"Sound Cancellation" is basically very simple. Sound waves from any transformer have certain characteristic amplitude and frequency composition. By sending out another sound beam with identical characteristics—*but opposite in phase*—you can make the sound waves cancel out each other, leaving a "cone of silence."

In practice, a loudspeaker is mounted on the transformer tank and beamed in the direction of an apartment house or dwelling as shown above. By adjusting the volume and phase of the speaker, sound levels have been reduced as much as 15 db at considerable distances (sound energy cut to 1/32 of its former value.)

"Sound Cancellation" is just one of many developments in transformer noise research that you can expect from the new G-E Sound Laboratory in the months ahead. General Electric Company, Schenectady 5, New York.

421-26

Progress Is Our Most Important Product

GENERAL ELECTRIC

Oil Reconditioning Cuts Replacement Costs

J. D. ALEXANDER, Associate Operating Engineer
N. J. GALUPPO, Indianapolis Power & Light Co, Indianapolis, Ind.

Transformer oil replacement costs have been cut in half by reclaiming and inhibiting oil now in service. For several years, regular oil tests have been made on transmission and subtransmission equipment. Minimum test standards were established that conform with those of eighteen to twenty other utilities now making regular oil tests.

To find the most economical method of solving the problem of oil sludging and transformer failures the following methods were considered:

1. Replace oil when heavy sludging or failure occurs.

2. Replace oil before sludging starts or before acidity content starts to cause deterioration of the insulation.

3. Reclaim and inhibit oil before sludging starts, or acidity reaches too high a point to reclaim economically.

Method 3 was selected because oil could be reclaimed and inhibited at half the cost of new oil. Method 1 was ruled out because equipment was expected to give uninterrupted service without costly failures over long periods of time.

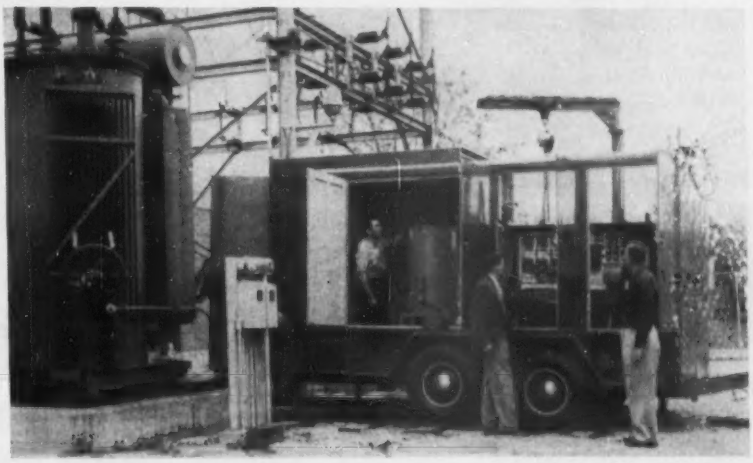
A 500-gpm filter unit was purchased and mounted on a trailer, to provide mobility. The trailer was designed to be hauled by the transformer repair trucks which are of two-ton capacity.

Reclaiming unit has two 400-lb capacity clay filtering tanks, an oil heater, and a vacuum dehydrator. It has a connected load of 57 kw and operates on 230-v, three-phase service.

On-the-spot tests on oil acidity are made by the operator. Final tests for records are made in the oil testing laboratory.

Oil is filtered while the transformer is in service and carrying load. The system lends itself to this type of operation because most transformers are within a 20-mile radius from the operating center.

Typical operation is to move the filter to the substation where the transformers are located. Arrangements are made for 230-v, three-phase serv-



OIL IS FILTERED while the transformer remains in service and carrying load. Filtering equipment is mounted on a trailer which is pulled by a two-ton transformer repair truck

Analysis for Reconditioning Oil in a Transformer Bank

Performance of Reclaimed Oil

Transformers	Gal Oil Each	Gal Oil Pumped	Neutral No. Before	Neutral No. After	Color Before	Color After	IFT Dynes/cm Before	IFT Dynes/cm After	Dielectric Kv Before	Dielectric Kv After
Ser. #2298272	2,040	11,416	0.48	0.08	4.5	2.0	15.2	31.6	35	35
Ser. #2298273	2,040	15,232	0.51	0.10	4.5	2.5	14.7	33.2	35	35
Ser. #2298274	2,040	13,358	0.55	0.13	4.5	2.5	14.5	33.6	35	35

Cost of Reclaiming Oil
(Reconditioner Cost $15,500)

Items	Total $	$ per Gal Oil Reclaimed
Depreciation at 10% per year	155.00	
Maintenance at $210 per year	21.50	
Power at $0.02 per kwhr	91.20	
Labor (21½ days)	387.00	
Clay at $0.025 per lb	100.00	
Make-Up-Oil at $0.34 per gal	78.88	
Placing Filter on Job and Changing Charges	72.00	
Cost of Clay Reclaiming	905.58	0.148
Inhibitor at $0.60 per gal	190.80	
COST OF RECLAIMING OPERATION	1,096.38	0.179

Savings by Reclaiming Oil

New Oil at $0.34 per gal	2,080.00
Oil Installation Cost at $0.03 per gal	183.00
Cost of New Oil Installed	2,263.00
Less Cost of Reclaiming Operation	1,096.38
SAVINGS BY RECLAIMING	1,166.62

ice. The filter is set in position and grounded. Service is connected, and the hose and filter system is wetted out. Intake of the filter is connected to the drain valve of the transformer, and the discharge is connected to the upper filter valve, or the conservator tank of the transformer. Oil is then filtered until it tests below a neutralization number of 0.15.

If the bank is made up of single-phase transformers, the filter hose is moved from one transformer to the other with the lowest neutralization number first before changing charges. A cost analysis of a typical operation on one bank of transformers is shown in the table.

Using standards established by Doble Engineering Co and twenty other utilities, approximately 190,000 gal of oil needs reclaiming. Reclaiming cost for this oil will be $0.179 per gal, or $34,010. Cost of same amount of new oil is $70,300. Savings as a result of reclaiming are approximately $36,290.

Graphite Anode Protects Cable Sheath from Corrosion

R. C. DeMARCO
H. C. JUDY, Philadelphia Electric Co, Philadelphia, Pa.

A new anode consisting of graphite rods and insulated wire has been developed by Philadelphia Electric Co for cathodic protection of lead-sheath cables in ducts. The anode overcomes the life limitations of metallic ribbon type anodes, but other characteristics are similar. No adverse effects have been determined from the use of the rods.

The anode is made of a series of 2-in. diam, 18-in. long-graphite rods electrically connected to an insulated wire. About 6,000 ft of the of the anode has been pulled into ducts, and its life is expected to be in excess of 30 years.

Previously, metallic ribbon type anodes were installed for cathodic protection, but they had a short life. The uniform protection current distribution along the anode surface caused uneven dissipation of metal which resulted in separation of the anode in a few years. This rendered the anode beyond the separation inoperative.

GRAPHITE ANODE is in excellent condition after being pulled through a fibre duct, which is 4-in. in diam and 320 ft in length

Brush Crusher Clears ½ Acre of Woods per Hour

PAUL CRITZER, General Foreman, Overhead Lines Dept, Cleveland Electric Co, Cleveland, Ohio

The Bushwacker used by the Cleveland Electric Illuminating Co clears approximately a half acre of wooded land per hour along high-line rights-of-way. In steady use, it is capable of clearing from five to six acres per day. Very heavy second-growth brush, including hardwoods up to 6 in. in diam and softwoods up to 8 in., do not slacken its pace.

For the type of undergrowth in northeastern Ohio, the cost per acre of manual clearance with two men—the number needed to run the machine—is approximately $100. Manual clearance was about 40% effective, and reclearing was required every three or four years. The crusher has reduced the cost by nearly 60% and extended

DISINTEGRATOR FLAILS are suspended from the revolving drum on the front end of machine. Power is transmitted from a 175-hp engine

General Electric announces
A COMPLETELY NEW LINE OF ENCLOSED FUSE CUTOUTS
ONE BASIC DESIGN OFFERS NEW ECONOMIES
. . . SATISFIES EVERY STANDARD NEED
GENERAL ELECTRIC

ONE BASIC DESIGN COMBINES ALL

NORMAL-DUTY, INDICATING OR DROPOUT DOOR
can be easily converted on-the-job from semaphore indication of blown fuse to dropout action of door after blown fuse, by the simple removal of converting bar.

NORMAL-DUTY INDICATING NON-DROPOUT DOOR.
Semaphore provides positive visual indication of blown fuse and is specifically designed for those users who desire the *non*-dropout operation—in which the door remains closed after a blown fuse.

HEAVY-DUTY DOOR, (or extra-heavy-duty door)
is indicating non-dropout type. It is particularly applicable at system locations where high or extra-high short-circuit currents can occur.

DISCONNECT DOOR
with hinged blade, has continuous current rating double that of standard fuseholder door—combines maximum safety with ready accessibility.

GENERAL ELECTRIC

STANDARD FUSE CUTOUT FUNCTIONS

General Electric's new line of enclosed fuse cutouts is the most important cutout development since G.E. first introduced the family concept in 1935. Besides the functional advantages described on the opposite page, the new G-E enclosed fuse cutout gives you all the features most engineers and linemen have wanted. G-E sales engineers and specialists collected hundreds of reports about the things users preferred most. These user preferences were carefully analyzed and built into the new cutout before its design was approved.

Currently available in ratings of 50 amperes, 5.2 and 7.8 kv, this new line will soon include a 100 ampere rating in both voltage classes. For more information get in touch with your nearest G-E Apparatus Sales Office or Agent. Or write for Bulletin GEA-6208 to General Electric Company, Section 433–7, Schenectady 5, New York.

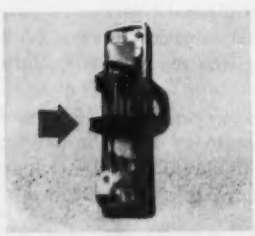
New General Electric cutouts have the features engineers and linemen prefer

ENGINEERS PREFER:

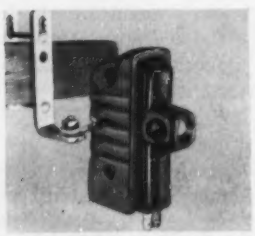
CONVERTIBLE-IN-THE-FIELD FROM INDICATING NON-DROP-OUT TO DROPOUT

COMPRESSION CLAMPING OF HANGER SUPPORT GIVES MAXIMUM MECHANICAL STRENGTH

V-WEDGE CONTACTS COMBINE ALL THE REQUIREMENTS FOR LONG SERVICE LIFE



SNUG FITTING NEOPRENE BARRIER HELPS PROTECT AGAINST INTERNAL FLASHOVERS

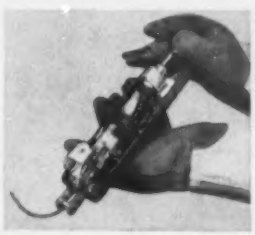


FLIP-OUT SEMAPHORE GIVES CLEAR INDICATION OF BLOWN FUSE

LINEMEN PREFER:

SAFETY GRIP DOOR FOR FUMBLEPROOF HANDLING WITH CONVENTIONAL SWITCH-STICK OR GLOVED HAND

PLASTIC TO METAL LATCHING BANISHES DOOR BINDING



FUSING IS EASY

EASY TO CONNECT

HINGED DISCONNECT BLADE GIVES VISUAL INDICATION OF OPEN OR CLOSED CIRCUIT

CAN'T MISS CLOSING OF DOOR

Brush Crusher

(*Continued from page* 140)

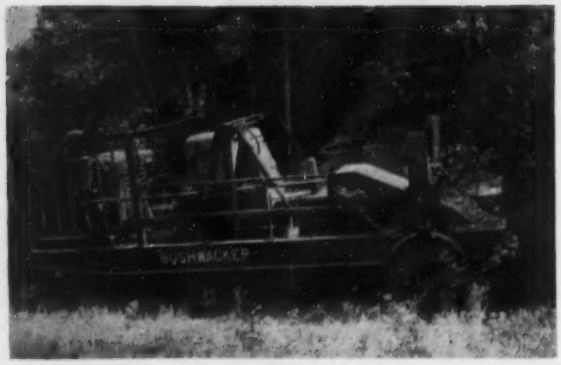
the reclearing cycle to every eight or 10 years.

Operating cost has been as low as $56 per day, one-half of which was for direct labor. This includes $7 per day for fuel. Over a period of years, maintenance and depreciation have raised the per diem cost to approximately $140.

The flails which cut and mulch the wood require continual maintenance. Inferior facings on the earlier models brought high replacement costs, but improvement in the steel has cut the cost. The company's present practice is to interchange two sets of flails on a weekly basis, retipping one set while the other is in use. Only one complete set of new flails has been needed in the three years the machine has been operated by the utility.

Efficient operation requires two operators because of the high noise level of two diesel engines and the flails in operation and the discomfort of the enclosed cab in the summer months. "Switching-off" reduces operator fatigue, and the off-duty operator walks along with the machine, searching out large rocks or unusually large stumps that could ruin the flails. These flails travel at a peripheral velocity of nearly 140 mph.

The Bushwacker consists of a specially modified crawler tractor upon which the disintegrator and its auxiliary equipment have been built. The disintegrator unit is an integral part of the machine. A tiltable frame supports the disintegrator in front of the tractor, and a counterbalancing 175-hp diesel disintegrator-drive engine is located behind. Power is transmitted through a hydraulically actuated clutch. A multiple V-belt and jack-shaft are positioned along the right side of the disintegrator.



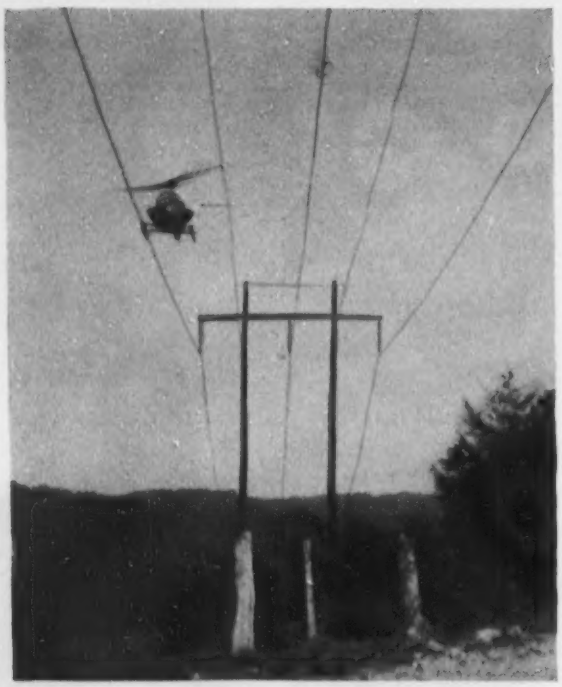
CHEWING UP a six-ft swath through a 10-year old stand of mixed hard and soft woods is accomplished easily with this brush crusher

The disintegrator consists of four rows of five flails, staggered to provide continuous impact over a 6-ft swath. The 35-lb flails are attached to the flail drum by heavy-section chrome-moly chain.

The fully-enclosed cab is of steel construction with safety glass and an insulated roof. An oil-washed pressurized air supply system to the cab is available.

Arkansas P&L Sprays Right-of-Ways with Helicopter

JOE Le ROUX, Arkansas Power & Light Co, Little Rock, Ark.



SPRAYING OF RIGHT-OF-WAYS with helicopter is an experiment for AP&L. Special attention is given to location of crops and orchards. Nearby landing fields are used to cut flying time

Arkansas Power & Light Co is seeking a more economical method of brush control under transmission lines in North Arkansas by using a helicopter and brush-killing spray. Approximately 100 miles of lines including the Harrison-Ozark-Beach, Norfolk-Harrison, and Norfolk-Gassville lines have been sprayed.

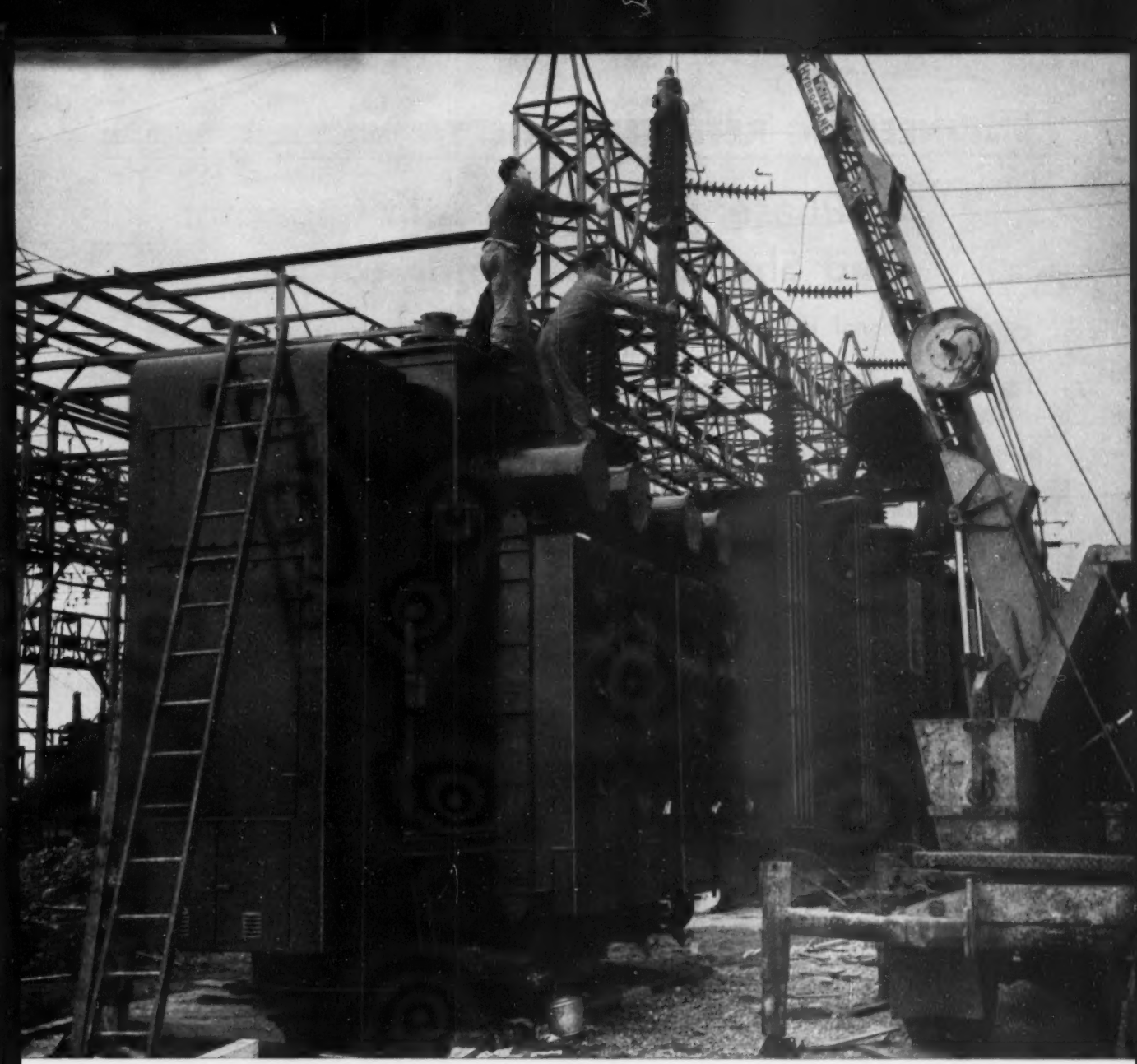
The helicopter carried 40 gal of spray on each trip. Approximately 36 gal of spray are used on a mile of brush 100 ft wide. In order to effectively spray the right-of-way, the pilot must fly the 'copter about 8 or 10 ft above the shield wire at about 25 mph and make three passes down the line—once on each side, once down the middle.

Spraying must be done when the wind velocity is less than 5 mph. Consequently, most spraying is done from about 5 AM to 7:30 AM and 5 PM to 7:30 PM when wind velocity is lowest. The downward blast of air from the 'copter's "revolving wing" helps place the spray.

The helicopter is especially adaptable for spraying brush in rugged terrain areas such as the mountains of North Arkansas.

Engineer L. H. Pond, who is in charge of AP&L's construction engineering, says the spraying operation is being conducted as an experiment. "We're looking for a more economical method of brush control on our right-of-ways," Pond said. "Chemical brush control may be an answer".

(*More How To on page* 150)



READY TO CONNECT IN 4 DAYS!

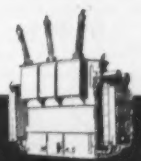
It took six men just four days to move this 40,000-kva General Electric transformer 300 feet from the railroad car, assemble and ready it for connection to the line at the Northfield substation of the Cleveland Electric Illuminating Company.

Like all G-E power transformers, this unit was shipped upright so that it did not have to be tipped at the site . . . and for faster, easier installation, it arrived in a one-piece tank so that no top-section needed to be field-assembled.

The next time you compare transformers, don't forget to include ***installation cost*** in your economic analysis. You'll find that you can often make big savings by using G-E units. General Electric Company, Schenectady 5, New York. 421-21

Progress Is Our Most Important Product

GENERAL ELECTRIC



Power Transformer NEWS

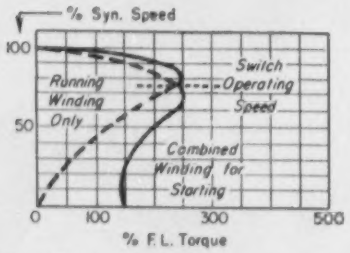
Split-Phase, Permanent-Split Capacitor And Shaded-Pole Motor Torques

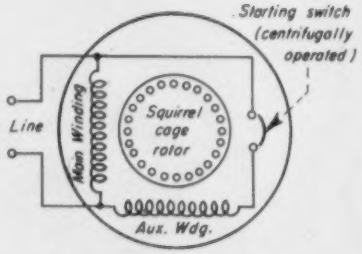
(Fractional HP Motor Sizes for Shaft-mounted Blowers and Fans)

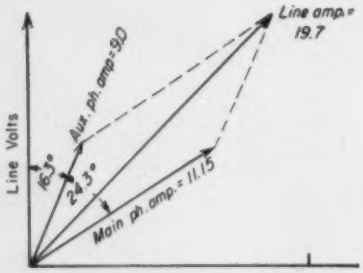
Typical speed-torque curves, connection diagrams and vector diagrams are given for single-phase, 60-cycle, single-speed, definite-purpose motors

T. E. M. CARVILLE,
Small Motor Division, Westinghouse Electric Corp, Lima, Ohio

Split-Phase Motors—1/20 to 3/4 Hp

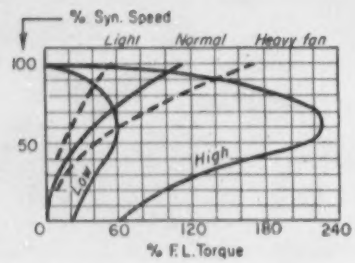


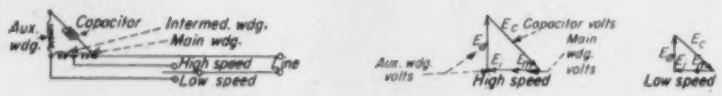




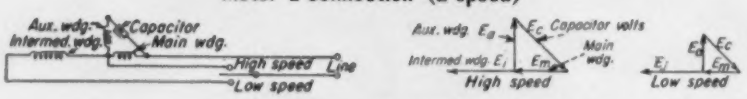
Note: Starting torque is limited by locked-rotor current restrictions, such as electric utility company regulations and NEMA standards. Breakdown torque is from 200 to 250% of full-load torque. Motor has constant-speed characteristics.

Permanent-Split Capacitor Motors—1/20 to 3/4 Hp





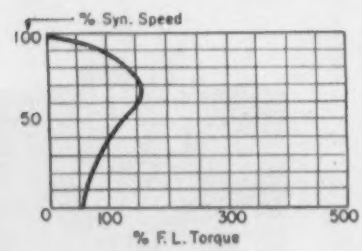
Motor L-Connection (2-speed)

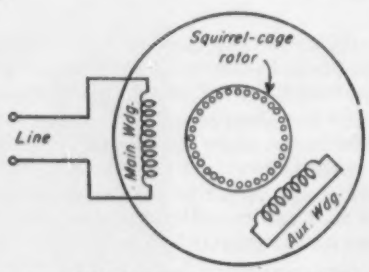


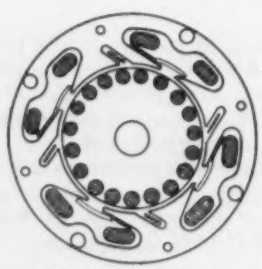
Motor T-Connection (2-speed)

Note: This is a capacitor-type motor using one value of capacitor for both starting and running conditions. Breakdown torque is approximately 200% of full-load torque. Starting torque is lower than for a split-phase motor because capacitor must be selected for operation at load condition. Running speed is essentially constant but can be changed by voltage control.

Shaded-Pole Motors—1/200 to 1/8 Hp





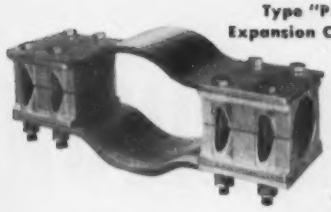


Note: Starting torque, obtained by shading coil shifting flux under shaded portion of pole to lag flux in main body of pole, is comparatively low. Breakdown torque is approximately 125 to 150% of full-load torque. Variable speed can be obtained by voltage control, using series resistor or choke, or by using a tapped winding.

Torque information for split-phase, capacitor-start and repulsion-induction motors was published in EW, Nov. 1, 1954, page 106.

The information for d-c motors will appear in an ensuing Engineering Reference Sheet.

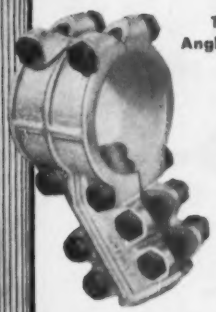
NOW READY



Type "PXPL"
Expansion Connector

Type "TU"
T-Connector

Type "FTE"
Angle T-Connector



Type "SL"
Stud Connector

Type "FTU"
T-Connector

DELTA-STAR'S new, complete Power Connector Catalog

Offering power connectors for every application—for use with copper and aluminum conductors

Whatever your connector needs may be, this new Power Connector Catalog has the proper fitting listed.

The catalog is compiled in ten sections. It includes an extensive Data Section to assist you in estimating, planning and engineering for future requirements. This section also contains tables, charts, technical articles and much additional information for every-day engineering use.

Other sections present tubing to tubing connectors, cable to cable, tubing to cable, tube or cable to bar, square tubing, flexible connectors, grounding and stud connectors, and terminal lugs.

A copy of this new DELTA-STAR Power Connector Catalog is yours for the asking. A letter on your company stationery to the factory or nearest Delta-Star representative, will assure your receiving a copy.

Delta-Star Power Connectors Meet Rigid Service Requirements

The cast-to-size connector principle, pioneered by Delta-Star, provides exceptional gripping action and assures positive electrical connection. Use of strong alloys and large bolts contribute to connector life. Simplified design assures ease of installation.

DELTA-STAR ELECTRIC DIVISION

H. K. PORTER COMPANY, INC.
OF PITTSBURGH
2437 Fulton Street • Chicago 12, Illinois
District Offices in Principal Cities

2% in 1945
37% in 1954
5% in 1945
50% in 1954
SECONDARY AND PRIMARY DISTRIBUTION
SERVICE DROPS

ALUMINUM CONDUCTOR IS TAKING OVER!

THESE FIGURES—from *Electrical World*, issue of May 17, 1954—are more evidence that the trend to aluminum conductor is stronger than ever before!

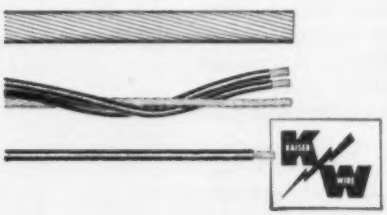
Today, 98% of all transmission lines are being built with aluminum—with services and distribution coming up fast. 37% of all secondary and primary distribution lines are now being strung with aluminum... and 50% of all service drops!

Major reason for the rapid changeover to light weight aluminum conductor is the huge savings it provides when used instead of copper ...savings that result from aluminum's far lower initial cost, faster and easier installation, lower maintenance costs.

This nationwide trend to aluminum conductor is being paced by Kaiser Aluminum's unsurpassed field, engineering and laboratory services—plus the continuing expansion of our production facilities. As a result...

THE NATION'S LARGEST SUPPLIER OF TRIPLEX AND ALUMINUM WEATHERPROOF IS

Kaiser Aluminum



For information on how to make better installations at lower cost with aluminum conductor contact any Kaiser Aluminum office listed in your telephone directory. Or get in touch with one of our many distributors. Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office:* Palmolive Bldg., Chicago 11, Illinois; *Executive Office:* Kaiser Bldg., Oakland 12, California.

Suspended Seat Permits Safe Cutting of Top Wires

A suspended seat was devised by A. J. Scott, California Electric Power Co, to eliminate the hazard to the workman of poles breaking out while the top wires on a carload of poles were being cut.

The suspended seat was built from an old airplane ejector seat. It is raised and positioned by a crane in the poleyard. A workman is strapped into the seat and lifted to a point above the loaded car. With a wire cutter, he breaks and removes the wires, and the poles roll onto the skids.

New Practices Reduce Service Interruptions on Rural Lines

H. S. LEWIS, Chief Distribution Engineer, Central Vermont Public Service Corp, Rutland, Vt.

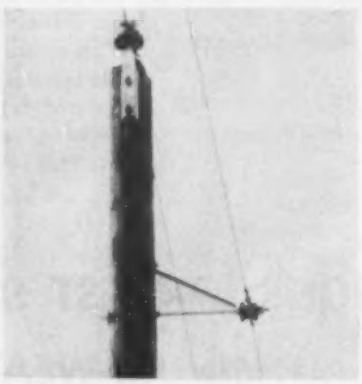
Two changes in 7.2/12.47-kv rural distribution line construction are expected to substantially reduce outages caused by whipping lines when snow unloads from conductors. The changes made by Central Vermont Public Service Corp are:

1. An extended spool bolt is used to obtain greater horizontal off-set between the pole-top hot primary and the grounded neutral, 4 ft below.

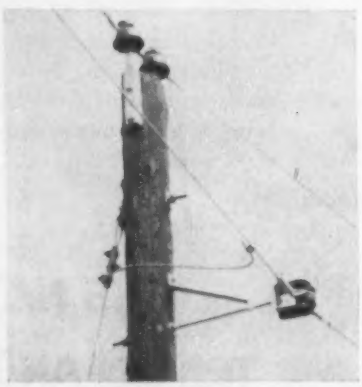
2. Neutral conductor is now always run on the same side of the pole relative to the hot primary.

New practices eliminate the cross-overs between the hot primary and neutral conductors. This was where most of the short circuits occurred when snow unloaded from the lower neutral conductor, causing it to whip up and contact the hot primary.

The extended spool bolt provides an additional 12-in. horizontal off-set between the neutral and hot primary, resulting in a total offset of 18 in. It can be used on angle as well as tangent construction by bolting an insulated clevis on the end, using a clevis with projections to prevent the nut from turning. For some angles the clevis alone placed on the outside corner will prevent the neutral crossing the primary in mid-span.



TANGENT CONSTRUCTION using extended bolt provides an additional 12 in. of offset between hot primary and neutral



ANGLE CONSTRUCTION shows the value of using the extended spool bolt for maintaining sufficient horizontal clearance

Before being adopted for general use, the extended spool bolts were tested. Bending tests showed adequate strength on wire sizes as large as No. O ACSR. When a clevis is attached to the end of the bolt, heavy loading may cause bending just outside the brace. However, this was not considered sufficiently objectionable to design and stock a different piece of hardware.

The other new construction practice is to run the neutral conductor on the same side of the pole and in the same relative offset position to the hot primary conductor at all times.

(*Continued on page* 154)

INSULATOR SPOOL alone is used on angles where the hot primary and neutral wires are placed on opposite sides of the pole

Here's a secondary fuse that waves a

RED FLAG

to indicate outages . . .

you get low-cost secondary fusing *plus* semaphore indication with the . . .

MATTHEWS CTS* Fuse

Here is the answer to your need for inexpensive protective fusing for secondary systems.

Matthews CTS Fuses give complete protection to secondary systems from service entrance to primary—at a very low cost. They can be used to isolate secondary capacitors, protect transformers in radial secondary systems, protect banked transformers, isolate service faults and for sectionalizing.

Picture at right shows closed view of Matthews CTS Fuse. Overall length including conductor tails is twenty-one inches. Available in a range from 5 to 200 amp. rating.

Red Flag Indicates Outage. The red plastic indicator on the Matthews CTS fits tight against the fuse cartridge until the fuse element ruptures. The flag is then released and instantly springs away from the cartridge. Linemen can easily spot this semaphore signal from the ground.

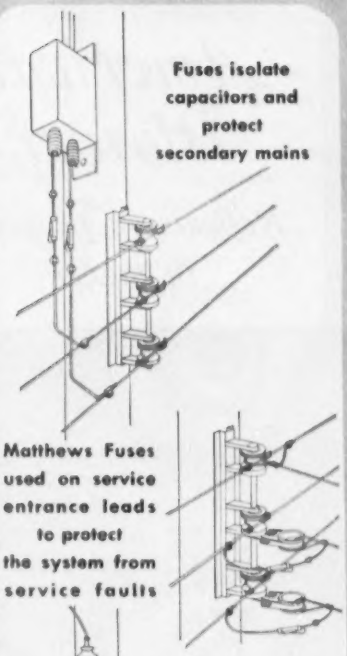
Stays Intact After Operation. Matthews Secondary Fuses do not fall apart and hang down after they blow and therefore cannot short-circuit other lines.

Can Be Co-ordinated—Curves Available. For the greatest possible protection on the entire system, Matthews CTS Fuses can be co-ordinated with primary fuses. Curves showing minimum melting and maximum total clearing time current characteristics are available on request.

*Cartridge Type Semaphore

Send for complete information and performance curves today

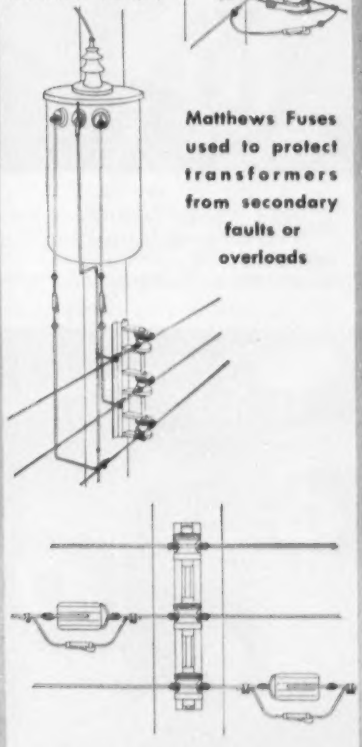
HOW TO PROTECT SECONDARY SYSTEMS WITH MATTHEWS CTS FUSES



Fuses isolate capacitors and protect secondary mains

Matthews Fuses used on service entrance leads to protect the system from service faults

Matthews Fuses used to protect transformers from secondary faults or overloads



Application of Type CTS Secondary Fuse on Secondary Network

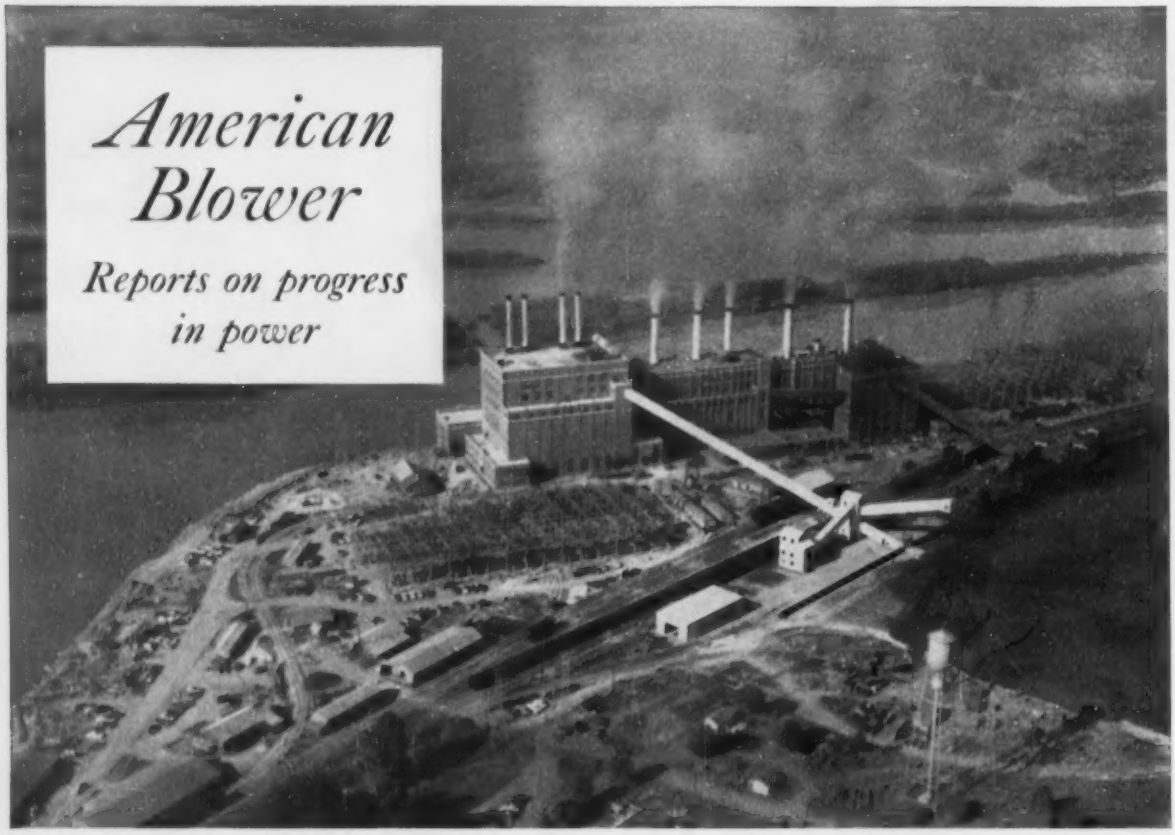
ABC INDUSTRIES

A·B·CHANCE CO.

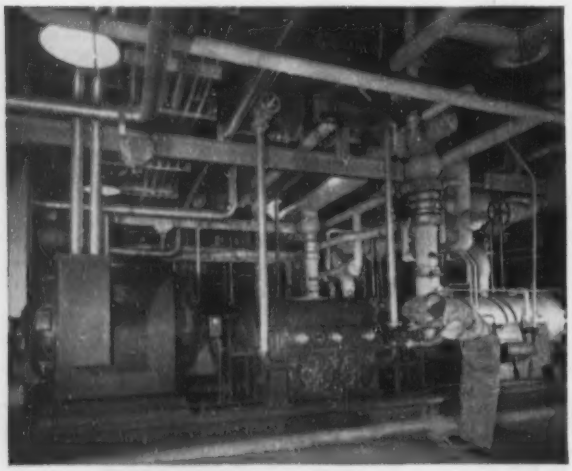
CENTRALIA, MISSOURI
SAN FRANCISCO, CALIFORNIA

CF54-24

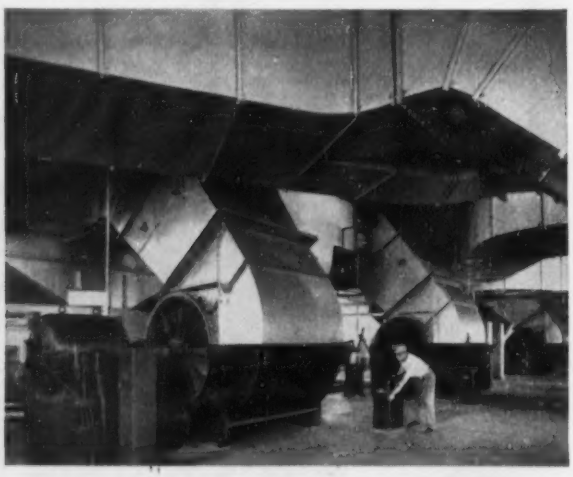
From a tiny trickle to a mighty



1. Duke Power's Buck Plant (above) near Salisbury, N.C., increased capacity by 250,000 kw in 1953. Two new generating units, recently completed, also added 266,000 kw to the Riverbend Plant near Charlotte, N.C. At the Dan River Plant near Draper, N.C., a new 150,000 kw unit is under construction, to be completed in 1955. Two other Duke Power plants are: Cliffside near Shelby, N.C. and Lee near Greenville, S.C.

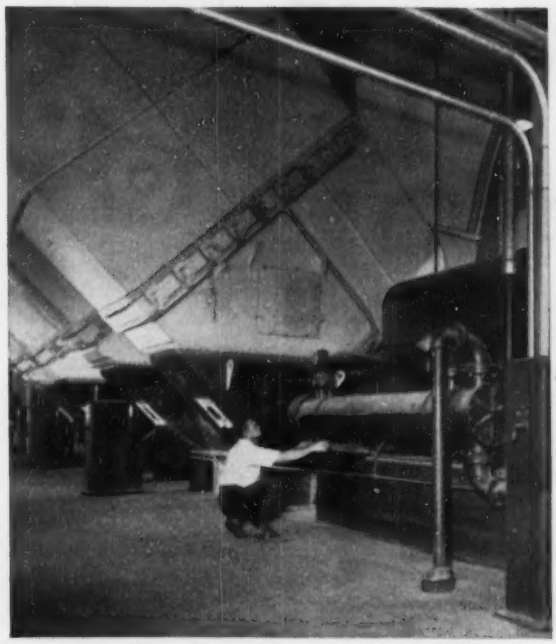


2. American Blower Gyrol Fluid Drive – type VS, class 6 – provides smooth, adjustable speed control of a boiler feed pump. It is coupled with a 1750 hp motor in the Buck Plant.

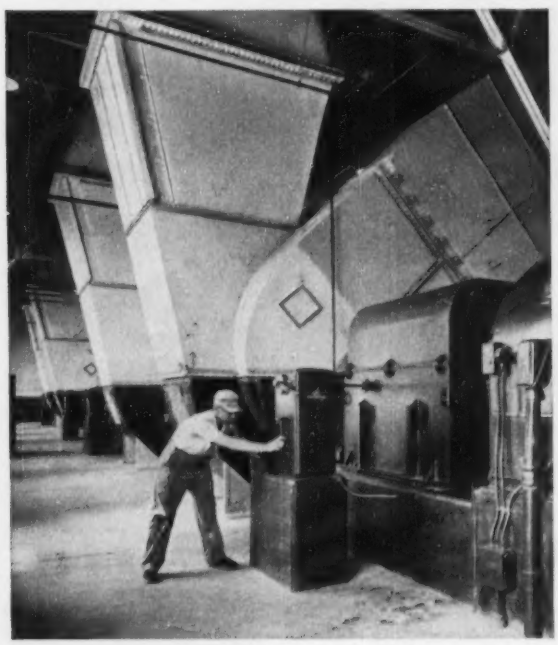


3. Four American Blower Forced Draft Fans are installed in Duke Power's Riverbend Plant. Each has a capacity of 143,000 cfm @ 100°F @ 1180 rpm @ 406 bhp.

2,211,000 kw—that's Duke Power!



4. Duke Power installed these four American Blower Induced Draft Fans at the Buck Plant. Each is driven through a type VS, class 4 American Blower Gyrol Fluid Drive.



5. Rated @ 234,000 cfm @ 296°F @ 637 bhp, each of these four American Blower Induced Draft Fans at the Riverbend Plant is coupled with an American Blower Gyrol Fluid Drive.

In its tremendous expansion, another leading power company chooses American Blower equipment

On April 1, 1904, a power line from a small hydroelectric plant at India Hook Shoals, S.C., was completed to Rock Hill, S.C. This was the simple beginning of the Duke Power Company system . . . a system that today serves over half a million customers in a 20,000-square-mile area in the Piedmont Carolinas—supplying electricity for some 35% of the nation's textile spindles . . . a system that through continued expansion will have an estimated capacity of 2,211,000 kw in 1955!

Planning far ahead of customers' needs is basic to this progressive, investor-owned utility. During the eight years from 1946 through 1953, Duke Power spent $231,000,000 to expand facilities, including $6,000,000 for the South's first steel-tower 230 kw line. Present plans call for additional expenditures, through 1964, of $30,000,000 annually. Duke Power is surging ahead with a dramatic fifty years of generating electricity behind them!

Supplying dependable air handling equipment and Gyrol Fluid Drives is the important part American Blower plays in Duke Power's tremendous expansion. (See pictures and captions.) It's a big role, one that is being duplicated in leading power and industrial plants everywhere.

If *your* future calls for expansion or modernization, talk over your plans and problems with an experienced American Blower representative. He can recommend efficient, economical equipment—including Mechanical Draft Fans, Fly Ash Precipitators, Dust Collectors, Heavy Duty Steam Coils and Gyrol Fluid Drives for boiler feed pump and fan control. Call your nearest American Blower Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

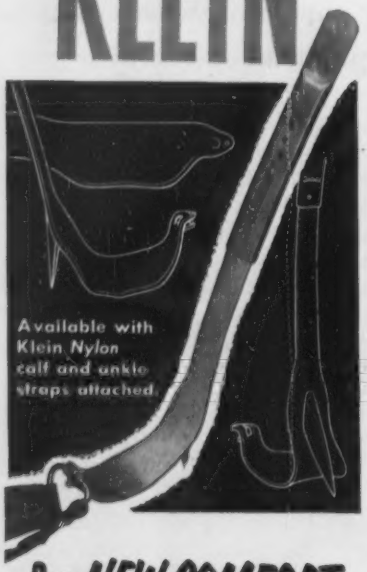
AMERICAN BLOWER

Serving home and industry:

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

Look to the Leader

KLEIN



for NEW COMFORT ...NEW SAFETY

Meet the big new favorite—Klein Climbers fully shaped to the contour of calf and ankle. That means a firmer, closer fit . . . a greater measure of safety. There's a new shape to the extra-wide stirrups also, for more comfortable arch support. Klein Climbers are made of forged steel, individually tempered and tested—aluminized for weather protection. Matched in pairs—adjustable length patterns 15 to 18 inches, specify 1945-ADJ—fixed length patterns 15 to 18½ inches, stock sizes specify 1945.

KG NO. 1 GAFF GAUGE
Keep this precision gauge handy for a safety check on proper spur shape. Plated steel—packed in durable plastic case.

1901-MG GAFF GUARDS
Protect the all-important spur of your climbers with this new Klein gaff guard. First quality leather with spring clip.

Instructions for sharpening gaff included.

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York.

Write for your free copy of the Klein Pocket Tool Guide today!

Mathias KLEIN & Sons
Established 1857 Chicago, Ill. U.S.A.
7200 McCORMICK ROAD • CHICAGO 45, ILLINOIS

New Practices

(*Continued from page* 150)

Previously, the neutral was always run on the road side of the pole and resulted in numerous crossovers, where numerous cases of trouble occurred.

Oil reclosers are used to reduce outages caused by momentary contacts but have been unsatisfactory where the unloaded neutral remained in contact with the primary. Many times it has been necessary to jar each pole with a sledge hammer to free the conductors.

Pre-Assembled Grounds Save Crew Time

Pre-assembled pole grounds consisting of a bronze plate fastened to a 40 ft length of ground wire and made up in the Cincinnati Gas & Electric Co shop have saved crew time.

Two slots are punched in the plate, 2 to 3 in. apart. The bare end of wire

(*Continued on page* 169)

GROUNDS are assembled in shop with 40-ft of ground wire fastened securely to bronze plate. A good supply is kept on hand

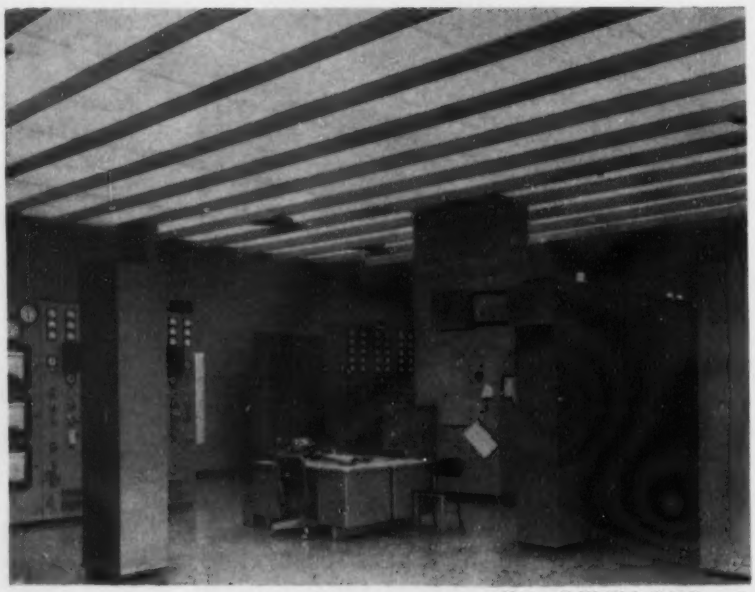


Photo: F. W. Wakefield Brass Co

Diffused Lighting Provides Easy Seeing

Completely diffused lighting in the control room of Consumers Power Co's Justin R. Whiting station eliminates the reflections which are frequently found on control room dials. A lighting intensity of 60 ft-c is provided. Diffusion of light and coordination throughout the entire area eliminate brightness contrasts and make for easy seeing. The floor itself, in fact, is a part of this well planned lighting installation, as can be seen in the photo.

F. L. Snyder, Westinghouse Vice-President, with four of the transformer types involved in major design improvements.

For 1955 . . . a complete new line of

Westinghouse Pole-Type Transformers

Once again—Westinghouse is proud to present to the industry new transformer design advances affecting the complete line of pole-type distribution transformers in ratings from 3 to 167 kva, single phase.

For years, Westinghouse has consistently set the industry pace with transformers of advanced functional design. The "CSP®", "CSPB®", Hipersil® cores, Coastal Finish and many other design advances are evidence of this leadership.

The specific features of this outstanding new transformer line are presented on the following nine pages in a manner which we believe will be helpful in analyzing the many advantages.

Improved design assures

More resistance to corrosion . . . superior tank sealing . . . greater simplicity in installing, operating, maintaining

Westinghouse engineers, in designing this new line, have consulted with many electric utility customers to set a new criterion for transformer dependability. The result is more for your transformer dollar than ever before.

The new Westinghouse pole-type transformer line presents new features which prevent *corrosion*. Moisture-entrapping seams and crevices along with corrosion-vulnerable hardware are eliminated.

Openings for bushings, breaker handle, as well as the joints between the tank rim, main cover and handhole cover, have been effectively sealed to prevent the entrance of moisture, air or foreign matter. As a result, the life of the transformer is greatly increased.

Other features simplify installation, operation and maintenance . . . get the transformer "on the line" easily and quickly and keep it there.

Here's what we've done to eliminate corrosion

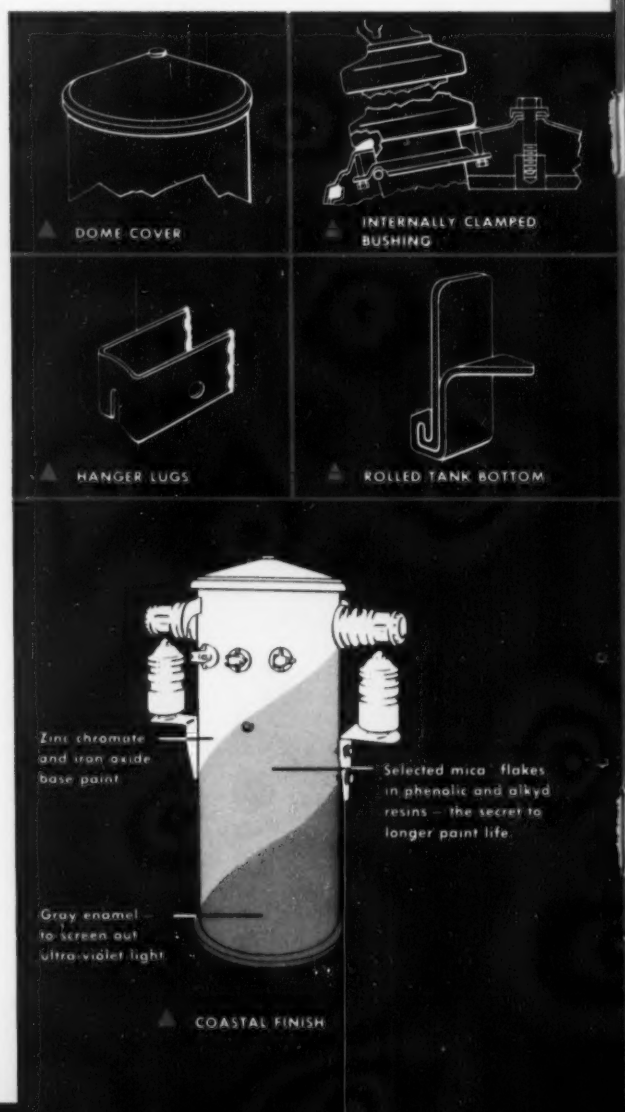
▲ **Dome cover** with unique single-captive retaining bolt assures positive runoff of water—eliminates all cover clamps, retaining rings and exposed threads. Nothing to corrode—complete paint coverage attained.

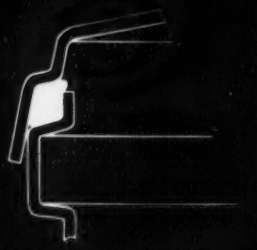
▲ **New, internally clamped bushings** eliminate external bushing flanges and threaded studs. High-voltage cover bushings are mounted on a raised boss to assure water runoff. Again—nothing to corrode.

▲ **Hanger and lifting lugs** are flash-projection-welded directly into the tank wall, thus eliminating all crevices and the corrosive hazard of moisture traps.

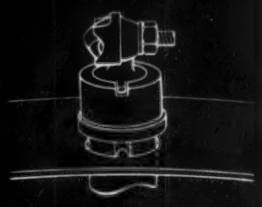
▲ **Rolled tank bottom** with paint flowed in and a tapered water shed prevents moisture entrapment.

▲ **3-coat Coastal Finish,** flowed on, affords protection against corrosive atmospheres . . . designed to last twice as long as ordinary transformer paints.


▲ DOME COVER
▲ INTERNALLY CLAMPED BUSHING
▲ HANGER LUGS
▲ ROLLED TANK BOTTOM
Zinc chromate and iron oxide base paint
Selected mica flakes in phenolic and alkyd resins — the secret to longer paint life.
Gray enamel to screen out ultra-violet light
▲ COASTAL FINISH

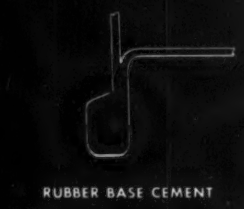


TANK COVER GASKETS



INTERLOCKED BUSHINGS

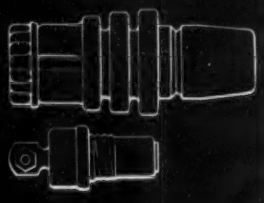
BUSHING GASKETS



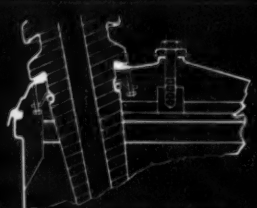
RUBBER BASE CEMENT

O-RING SEAL

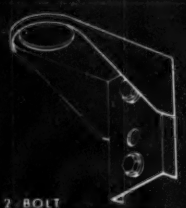
HEIGHT REDUCED



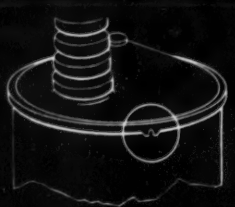
ALUMINUM OR COPPER LEAD



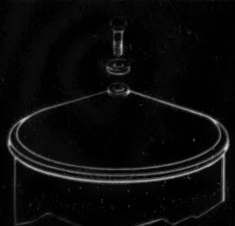
BUSHING CROSS SECTION



2-BOLT ARRESTER MOUNTING



COVER CENTERING DEVICE



ONE BOLT / CAPTIVE INTERIOR ACCESSIBILITY

SIMPLIFIED HOOK-STICK OPERATION

These features assure superior tank sealing

● **All bushings are sealed** with cork-Neoprene gaskets restricted within undercut areas. Any gasket flow serves only to make the joint more secure.

● **New, interlocked low-voltage bushings** prevent any possible breaking of the bushing seal during installation or maintenance.

● **Tank cover gaskets,** like bushing gaskets, are retained in confined quarters. Constant gasket pressure on both the main cover and handhole cover is maintained throughout the gasket periphery and under changing temperature conditions by the spring-follow action of the cover assembly.

● **Rolled tank bottoms** formed with five thicknesses of steel are even more securely sealed with rubber-base cement applied during fabrication.

Here's why these transformers are easier to install — operate — maintain

■ **Over-all height** of 25, 37½ and 50-kva, wall-mounted bushing units has been reduced to permit mounting on existing "joint-use" poles when "change-outs" to larger sizes are necessary. Reduced height still meets EEI-NEMA standards—hanger lug spacing.

■ **HV and LV bushing terminals** are designed to accommodate *either* copper or aluminum line leads.

■ **Bushing cross-sectional area increased** where it enters the tank wall. Rigidity and strength are improved. Internal mounting arrangement simplifies maintenance.

■ **New "Valvex" expulsion arresters** are mounted on the tank wall simply with two bolts, thus permitting easy adaptability to any line arrangement.

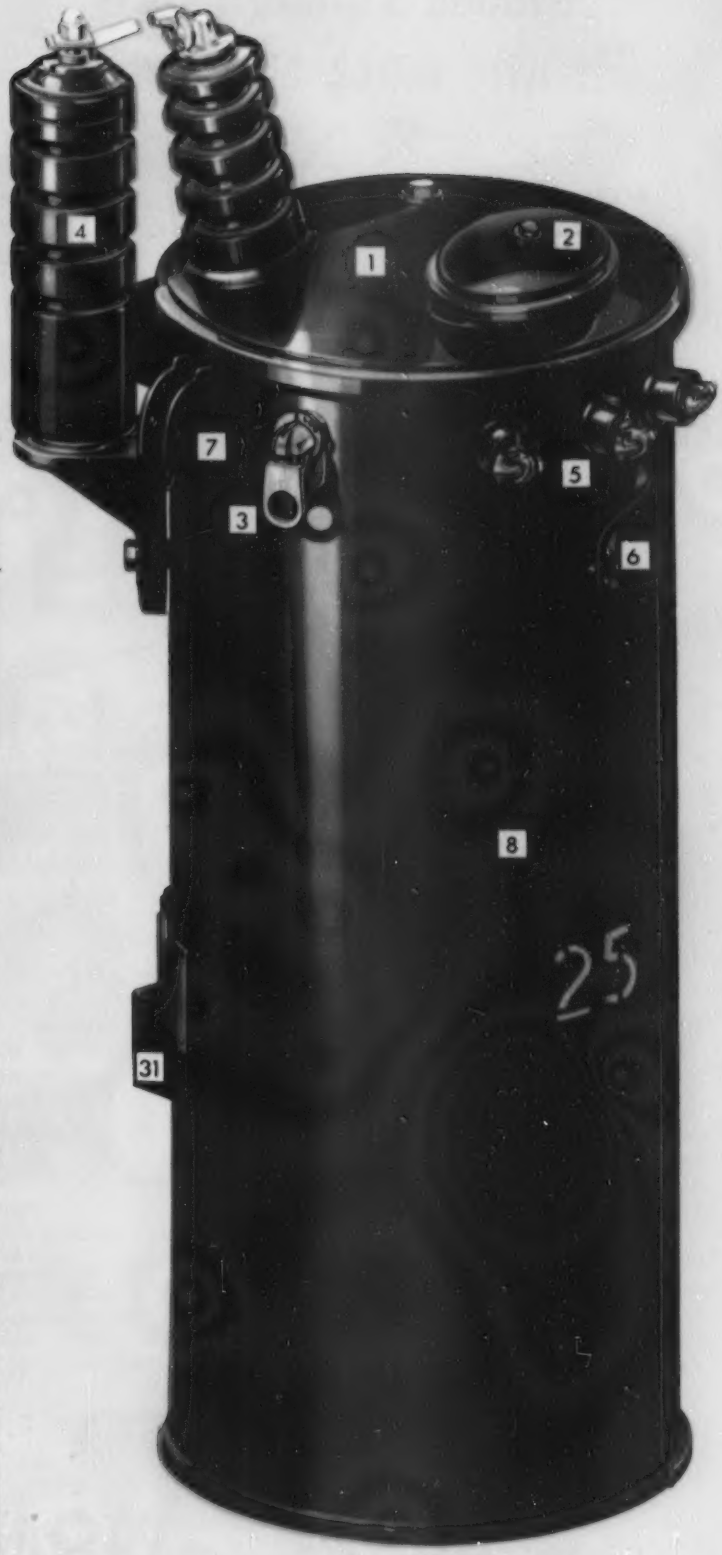
■ **Cover centering device** for transformers with cover-mounted bushings assures quick, correct positioning of tank cover.

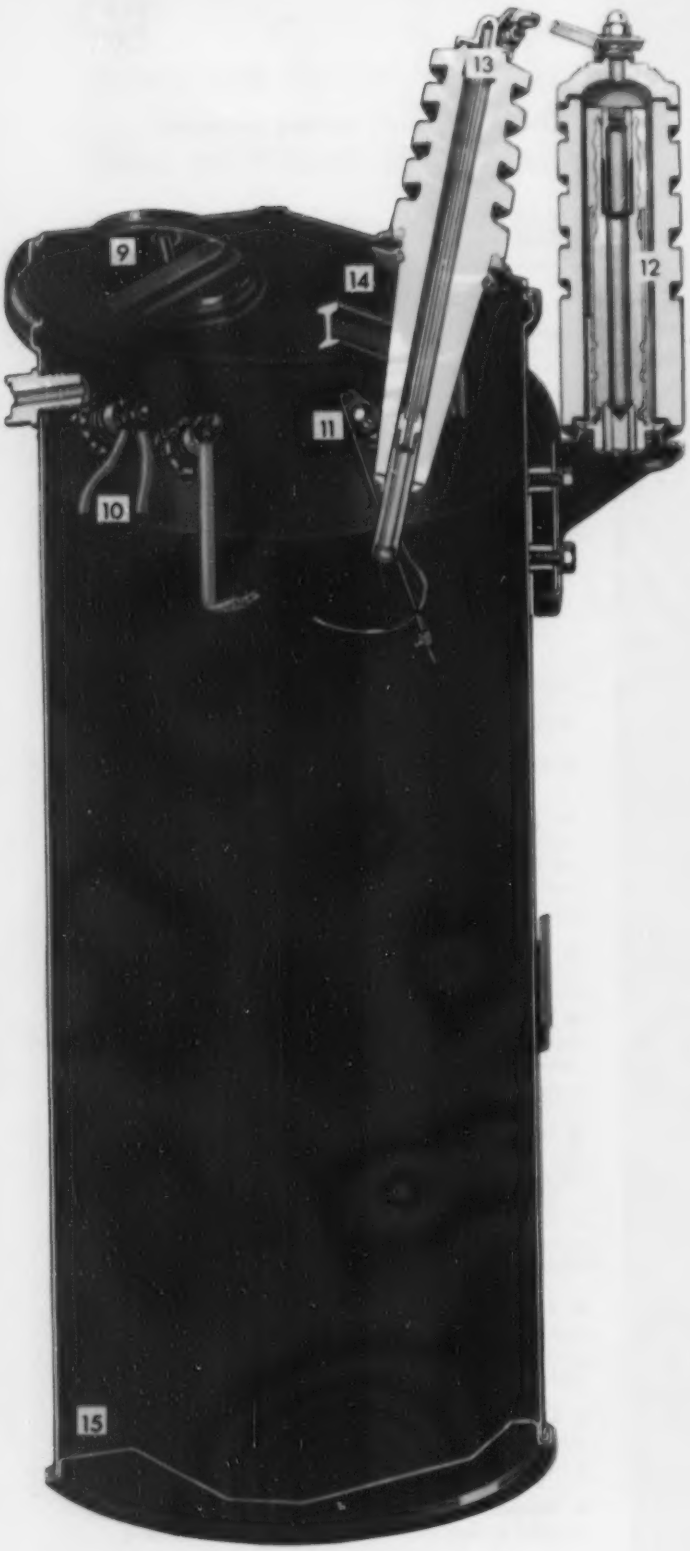
■ **Accessibility to transformer interior** is facilitated by removal of just one bolt. Bolt is captive in the cover—cannot be lost. Positive seal assured when cover is replaced.

■ **Breaker handle** operation is now possible with but a touch of the hookstick. The new O-ring seal assures a tight joint around this handle.

■ **Stamped identification** of low-voltage leads from winding makes reconnection easy when necessary.

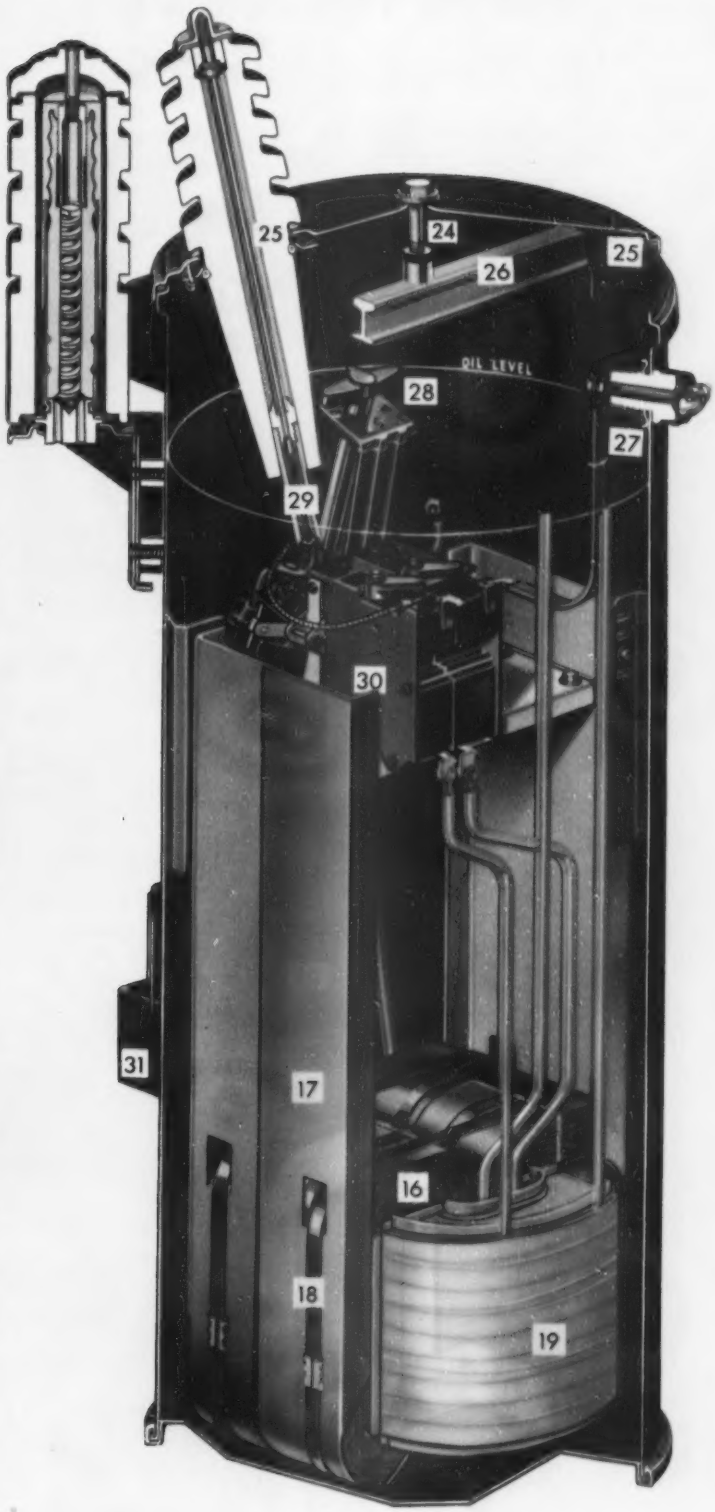
1. High Dome Cover
2. Handhole Cover
3. Breaker Operating Handle with O-Ring Seal mounted behind handle
4. "Valvex" Expulsion-Type Lightning Arrester mounted simply with two bolts
5. Low-Voltage Interlocking Bushing. Terminals suitable for aluminum or copper conductors
6. Grounding Strap
7. Lifting Lug
8. Coastal Finish

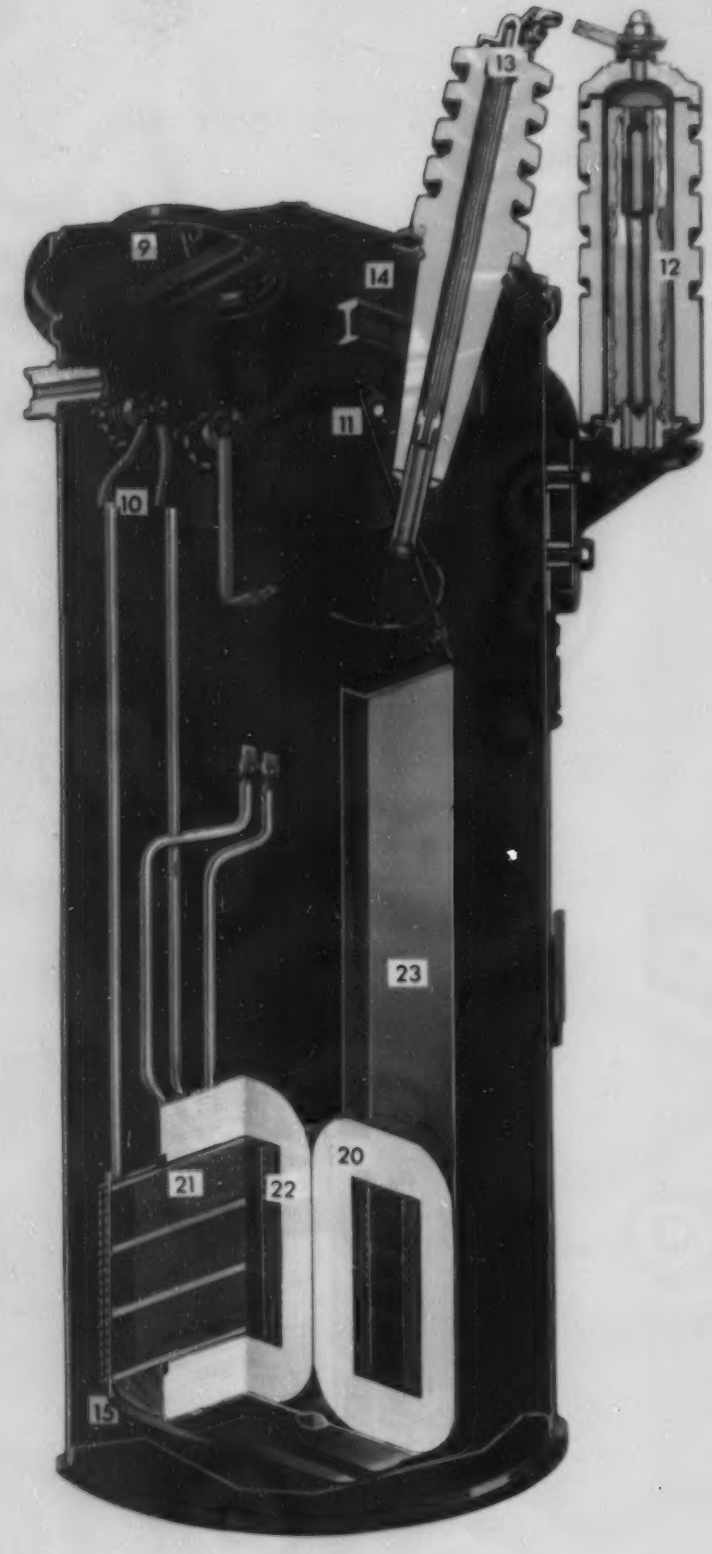




9. Handhole Cover Clamping Assembly
10. Low-Voltage Bushings
11. Breaker Operating Handle Mechanism
12. "Volvex" Expulsion-Type Lightning Arrester
13. High-Voltage Bushing Terminals suitable for aluminum or copper conductors
14. Inside mounting for High-Voltage Bushing
15. Rolled Tank Bottom

16. Hipersil® Core
17. Wrap-Around End Frame
18. "C" Core Banding Strap
19. Winding





20. Hipersil® Core
21. High-Voltage Winding
22. Low-Voltage Winding
23. Wrap-Around End Frame

24. Captive Retaining Bolt

25. Gaskets in confined quarters

26. I-Beam Clamping Bar

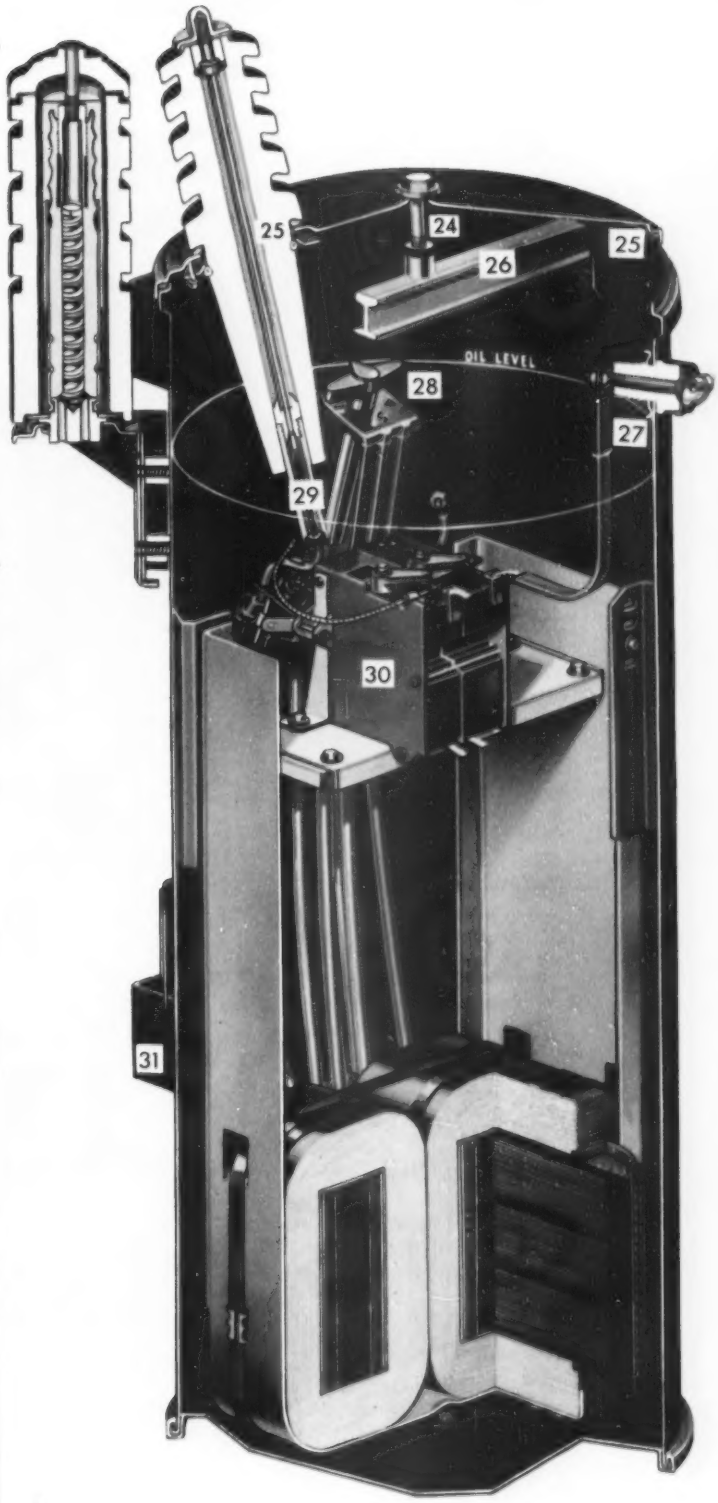
27. Low-Voltage Bushing (not threaded in Tank Wall)

28. Tap Changer with handle above oil level

29. Protective Link

30. Secondary Breaker

31. Hanger Lug



"National Safe Transit Committee" Approved!

Westinghouse pole-type transformers pass shipping and handling tests devised by the National Safe Transit Committee. These tests give assurance that Westinghouse transformers will arrive safely—under all normal shipping and handling conditions.

The Vibration Test, for instance, simulates actual vibration, shock, movement, pitch and toss of freight cars and motor trucks. One hour on this test is equivalent to shipping a transformer from Sharon, Pa., to Chicago. The Impact Test simulates dropping the transformer off a truck or shipping dock.

All Safe Transit Tests achieve validity through the sound basis of actual shipping experience, and the unqualified approval of both carrier and manufacturing representatives.

The Safe Transit Label, shown at right, approved for the first time on *any* transformer, is your evidence that Westinghouse is doing its part to see that built-in quality reaches you intact—ready for immediate installation.

For additional data on the new Westinghouse pole-type transformer line, call in your nearby Westinghouse representative or—if you prefer—write direct to Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

1955
MODEL
DISTRIBUTION
TRANSFORMER
PRE-TESTED
SAFE TRANSIT
SHIPMENT
The manufacturer certifies that this PACKAGED PRODUCT meets the pre-shipment testing standards established by the National Safe Transit Committee and will withstand NORMAL transportation and handling hazards.
NATIONAL SAFE TRANSIT COMMITTEE
1346 Conn. Ave., N. W. Washington 6, D. C.
MAKE
SAFE HANDLING
YOUR JOB!

Bob Ray, Manager Distribution Transformer Sales, with one of the new pole-type transformers packed and ready for shipment. The Safe Transit Label is shown at upper right on shipping carton.

YOU CAN BE SURE...IF IT'S Westinghouse

B-6403
CP-1026

Printed in U.S.A.

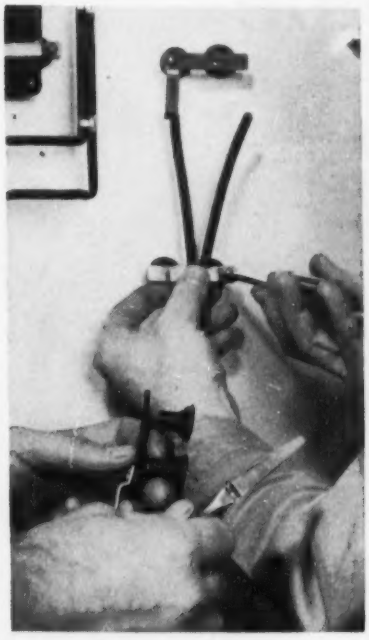
Pre-Assembled Grounds

(*Continued from page* 154)

is fed in one slot and out the other so that the wire is held securely by the plate. The connection is then soldered to give a good electrical connection.

Plates are nailed to the bottom of the pole before a pole is set. Then the lead is cut to desired length after it has been stapled to the pole.

Bronze plates are salvaged from old oxide film lightning arresters. Copper plates could be substituted.



Suction-Cup Supports Aid Panel Wiring

CHESTER J. PROSS, ALLEN F. COLPITTS, Detroit Edison Co, Detroit, Mich.

Removable clips, supported by rubber suction cups, are being used to support wires while panels are being wired in the Detroit Edison Co shops. The suction cups can be placed on the panel as desired, and the clips support the many wires of the panel while wiring work progresses. This eliminates welding supports to the panels.

Clips are only used to hold wires while assembling, after which the wires are tied together, and the suction-cup supports are easily removed. The new clips eliminate the material, cutting, bending, drilling, and welding of the old wire supports to the panel.

"You wouldn't believe it was the same office!"

BEFORE...
Glaring, noisy loft-type office.
WHAT A DIFFERENCE!
AFTER...
SYLVAN-AIRE System brings soft, comfortable working light . . . reduces noise levels, too.

New SYLVAN-AIRE Lighting System improves sight and sound ...quickly installed!

Architects and business executives acclaim the transformations made with Sylvania's advanced SYLVAN-AIRE System.

This lighting system consists of translucent, corrugated plastic supported by light-weight aluminum channels. Longitudinal "V"-shaped Sono-Wedges, filled with glass fiber also greatly reduce distracting noise.

The structural elements of the SYLVAN-AIRE System are designed for suspension from either single or multi lamp units, necessary to supply the proper level of illumination.

There's lots more you should know about the extreme versatility, efficiency and ready installation of SYLVAN-AIRE. For illustrated literature address 4X-2830 at Sylvania.

SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

In Canada: Sylvania Electric (Canada) Ltd.
University Tower Building, St. Catherine Street, Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS • TELEVISION

Kennecott is throwing 121,040,000 punches into your fight for adequate home wiring!

The advertisement on the opposite page means business to you . . . *more business* from greater consumption of current, increased sales of electrical appliances!

As you see, it's an advertisement signed by the Kennecott Copper Corporation, and it tells homeowners about one of the many discomforts of living in an inadequately-wired home.

This is but a single advertisement in a complete campaign of ads now appearing in the pages of *The Saturday Evening Post* and *This Week* national magazines. Totaling more than 121,040,000 hard-hitting messages, this great drive is hammering home to the homeowner the inconveniences and discomforts of undersized, overloaded household wiring.

TIE IN WITH US! Send for FREE copies of new consumer booklet, "The ABC of Home Wiring;" free newspaper mat ads, reprints and posters for your own local promotion. Address your letter to Carl Lenz, President, Kennecott Sales Corporation, 161 East 42nd Street, New York 17, N. Y.

What was the trouble before?

She couldn't blame her brand-new coffee-maker for working so slowly. The *real* villain was her outdated household wiring! Weak wires... *small* wires. Wires that couldn't carry *full loads* of electricity. Until she *did* something about it, this lady had no end of trouble with the electrical system of her home!

Her lights dimmed whenever she turned on an appliance. Her TV picture had a habit of shrinking in size. Her fuses or circuit breakers kept blowing or tripping too often.

If your own house is 10 or more years old, the odds are 4 to 1 that *you*, too, have these same electrical annoyances. You're *not* getting the most out of *any* of your appliances. What's worse, you're *losing* money in current wasted by undersized, overheated wires.

Even a home that's fully wired today may face electrical starvation tomorrow. One new appliance – like a room air conditioner or a laundry ironer – may overload your wiring!

Why not do what this lady did? Call an electrical contractor or your public utility. Learn how easy it can be, how little it can cost, to modernize your home electrically!

Get FREE booklet!

"The ABC of Home Wiring" tells all about *your* home wiring – and how you can make it serve you better. It's easy to read, fully illustrated, and will be sent to you free of cost. For your copy, write now to Kennecott Copper Corporation, Dept. S7, Box 238, New York 46, N. Y.

Published for your information by **Kennecott**
COPPER CORPORATION

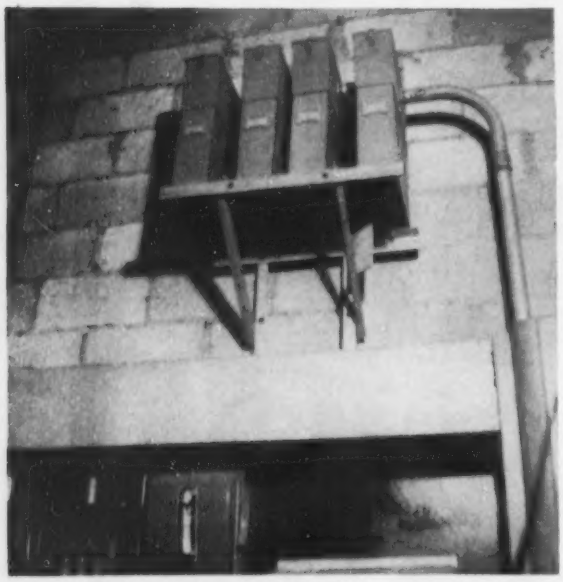
Fabricating Subsidiaries: CHASE BRASS & COPPER CO., KENNECOTT WIRE & CABLE CO.

This advertisement, appearing in SATURDAY EVENING POST and THIS WEEK, will reach more than fifteen million readers. It is only one of a regular series of Kennecott advertisements aimed at educating the public to the importance of adequate home wiring.

INDUSTRIAL APPLICATIONS

Capacitors Increase Production and Save $100 Monthly

C. D. ANDERSON, Power Sales Engineer, Savannah Electric & Power Co, Savannah, Ga.



WALL-MOUNTED capacitor bank with 4-7½ kvar units connected on load side of overcurrent device on 150-hp hog motor. Installation of additional banks in plant reduced copper sizes and power losses

The installation of 170 kvar in capacitors at the Bradley Plywood Corp, Savannah, Georgia, increased production and saved approximately $100 monthly on power bill. The cost of the installation has been amortized in less than two years, according to Waldo Bradley, company president.

This plyboard plant had a very bad voltage condition at a 75-hp motor and other load which was at the end of a 500-ft long feeder. To correct this condition it would have been necessary to install a separate bank of transformers and go to a primary distribution system. It was finally decided to install a 45-kvar bank of capacitors on the end of this feeder with a resulting increase of voltage.

The $1,000 spent on this installation was far less than would have been spent for 3 - 37½ kva transformers and the necessary primary distribution system.

Through continued expansion of the plant, the point of delivery has been changed to a new and larger transformer bank furnished by the utility and this 500-ft feeder split in half. The original capacitors are still in service with an additional 125 kvar added throughout the plant, resulting in reduced copper sizes and less power losses.

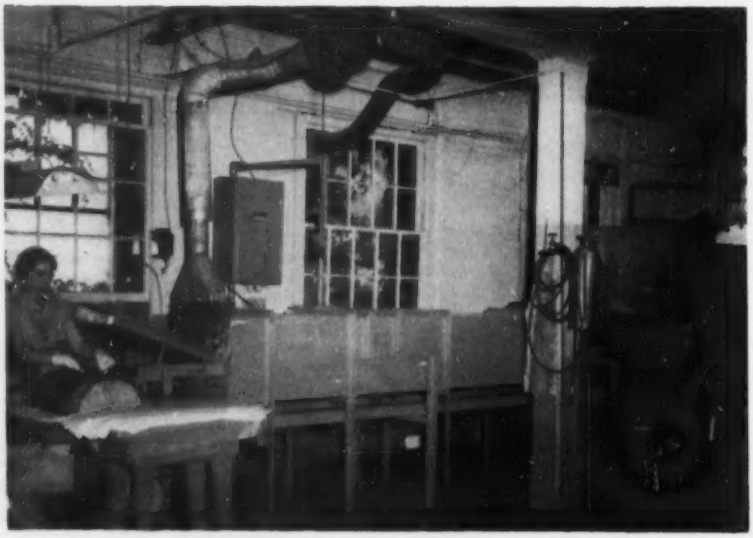
Electric Oven Speeds Clock Output

W. B. REARDON, JR., Industrial Power Engineer, Connecticut Light & Power Co, New Britain, Conn.

A homemade electric drying oven at the Sessions Clock Co, Forestville, Conn. quick-dries and cures lacquer on small metal parts in about 2 min. and is capable of turning out 1,000 finished pieces per hour. It has proven so satisfactory that an additional unit has been made to take care of normal production. Designed and built by C. A. Swanston, Sessions' master mechanic, the oven is conveyorized and completely automatic.

Although the new oven has 30-kw in strip heaters, the power consumption is actually less than that of the previously-used 12-kw oven, because with the thermostatic controls, the load is "on" only about one-quarter of the time.

A chain conveyor with a variable speed drive carries sprayed parts from the automatic spray booth through the oven which is constructed of 3-in. thick asbestos and carefully selected standard parts. The temperature is held at 525 F. The spray gun operation is controlled by an electronic timer. The operator simply places a piece of work on the turntable and presses a button. The controller starts the work revolving, turns on a blast of air to clean the work and sprays it with lacquer. It then slides out to the conveyor and is carried through the oven. The whole time cycle takes only one second.



QUICK-DRYING LACQUER on small metal parts for electric clocks in 30-kw homemade, conveyorized electric oven is done in 2 min. Machine turns out 1,000 pieces per hour

It costs you a lot of money to determine what you need and to order all these CABLE JOINT materials as separate items

YOU SAVE TIME AND MONEY

when you buy G&W Splicing Kits

You can order splicing kits by specifying:—

Quantity; Type—2 way or 3 way Y; Complete cable data *including number, size and type of conductors, kind and thickness of insulation and covering, shielded or nonshielded;* operating voltage, grounded or ungrounded neutral. When wanted.

Send for Bul. J54 for complete information.

G & W ELECTRIC SPECIALTY CO.

Dept. SK, 7780 Dante Avenue, Chicago 19, Illinois

Representatives in principal cities of U.S.A.
In Canada—Powerlite Devices, Ltd., Toronto, Montreal and Vancouver

J543

G&W

Power Pits Carry Four Electrical Services

Explosion proof receptacles are in 4,000 ft of electrical service trenches in hangar section of Grumman Aircraft Engineering Corp's new Peconic River plant near Calverton, Long Island, N. Y. Four complete systems are made available in the 2 ft 6 in. deep by 2 ft 8 in. wide power pits which run lengthwise of the building: 28-v dc; 400-cycle ac; 120-v, single-phase, 3-wire (grounded neutral) 30-amp ac; and 208-v, three-phase, 4-wire (grounded neutral) 30-amp ac. Broadway Maintenance Corp was responsible for complete electrical installation.

Tubular Heaters Fry Better Meat Balls

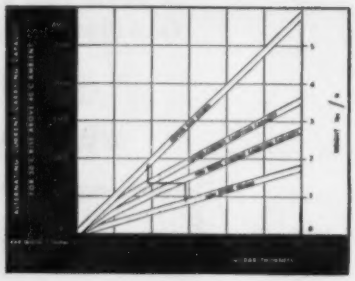
Frying meat balls with hair pin shaped tubular heaters at Chef Boy-Ar-Dee Division of American Home Foods, Inc, Milton, Pa., produces a steady quantity of high quality, uniform, and tastier product with very little loss, at lower cost—with low investment and overhead.

This first unit consisted of 168 kw of hair pin shaped tubular heaters mounted above a traveling stainless steel belt, upon which the meat is placed to be fried. The entire unit is enclosed by a stainless steel housing. The heating units are connected in eight groups with controls for varying the power input, thus affording eight temperature controlled zones. These zones make varying temperatures available which is desirable in the searing, cooking, and browning of the finished product. This equipment is capable of producing a steady quantity of high quality and tastier product with very little loss and at lower cost.

Chef Boy-Ar-Dee's customers were quick to recognize this improved product . . . and production schedules had to be continually increased to keep up with demand for the product. In order to further increase production, 42 kw additional units in two zones were added to the fryer. The management, realizing the further potentialties of this new method, have expanded their prepared meat products to such an extent that an additional frying unit was necessary. This new unit is similar in size and principle to the present existing unit. Willard Zimmerman, Industrial Power Representative, Pennsylvania Power & Light Co, Williamsport, Pa.

(Advertisement)

Electrical Applications of Aluminum



RABC (Reynolds Aluminum Bus Conductor)

New RABC provides greater strength (29,000 psi tensile and 25,000 psi yield guaranteed minimum) with very little effect on electrical conductivity and unlimited range of sizes and shapes.

Graph shows current and weight characteristics of both copper and new RABC. For example, a current load of 700 amperes requires a 2" x ¼" copper bar weighing just under 2 lb/ft, compared to an RABC aluminum bar 2.8" x ¼" weighing ⅘ lbs/ft. Thus size is increased only a little more than ⅓ and weight is decreased 60%.

In addition to strength advantages, RABC is available in an unlimited range of sizes and shapes. It is no longer necessary to use oversize conductors because of intermediate size limitations. Other basic advantages of aluminum conductor include more conductivity per dollar; long range availability; excellent resistance to corrosion; light weight which permits faster stringing and saves on labor costs.

For full details on RABC contact your nearest Reynolds Branch Office or write Reynolds Metals Company at the address on the facing page.

An Engineering Service

The Reynolds Metals Company has an engineering service to help you on any type of electrical application for aluminum. For example, Reynolds engineers will conduct meetings with your men and provide them with the latest information on all phases of aluminum design and fabrication. This service is available without cost or obligation.

For full details contact your nearest Reynolds Branch Office or write Reynolds Metals Company at the address on the facing page.

Now You Can Specify REYNOLDS COVERED ALUMINUM CONDUCTOR

for secondary lines and service drops

Now! You can get highest quality Neoprene covered aluminum conductor from Reynolds—single conductor and self-supporting duplex, triplex or quadruplex.

Why aluminum conductor? Because the lighter weight of aluminum speeds installation, cuts labor costs and permits longer spans. And because the initial cost of aluminum is lower. These factors add up to important savings on your secondary distribution line and service drop installations.

Why *REYNOLDS* covered conductor? Because the tough Neoprene covering is long-lasting and weather-resistant. Because Reynolds has modern facilities for producing conductor and cable with quality control from mine to finished product. Because these modern facilities are backed by experienced production, engineering and sales personnel. And because this help—as proved in countless Reynolds ACSR installations—is readily available to you both in the office and in the field!

For full details on Reynolds Neoprene Covered Aluminum Conductor call your nearest Reynolds Branch Office or write *Reynolds Metals Company, 2584 So. Third St., Louisville 1, Ky.*

"REYNOLDS ACSR FOR YOUR TRANSMISSION LINES"
Conforms to or exceeds ASTM and ASA specifications. Reynolds ACSR Manual for Engineers contains complete basic line design, sag, staking, and line erection information, charts and tables. This book is available without charge when requested on your business letterhead.

See "Mister Peepers", starring Wally Cox, Sundays on NBC-TV

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

5000 WD

the New

YORK-HOOVER TWO-MAN LINE BODY

model 5000 WD is a sound investment for YOU...

because it will do your line work *at less cost—quicker* and *safer.*

With complete equipment it will dig the hole and set the pole, normally in a matter of minutes, all within full view and control of the truck operator.

Backed by 61 years' experience and embodying skillful engineering and honest workmanship, the model 5000 WD body with equipment represents a truly outstanding investment.

Before you purchase any line equipment, make sure you have thoroughly looked into this modern, up-to-the-minute unit by York-Hoover.

GET THE FACTS! Write for Bulletin No. 931 today.

York-Hoover Corporation
YORK, PENNSYLVANIA
Body Division

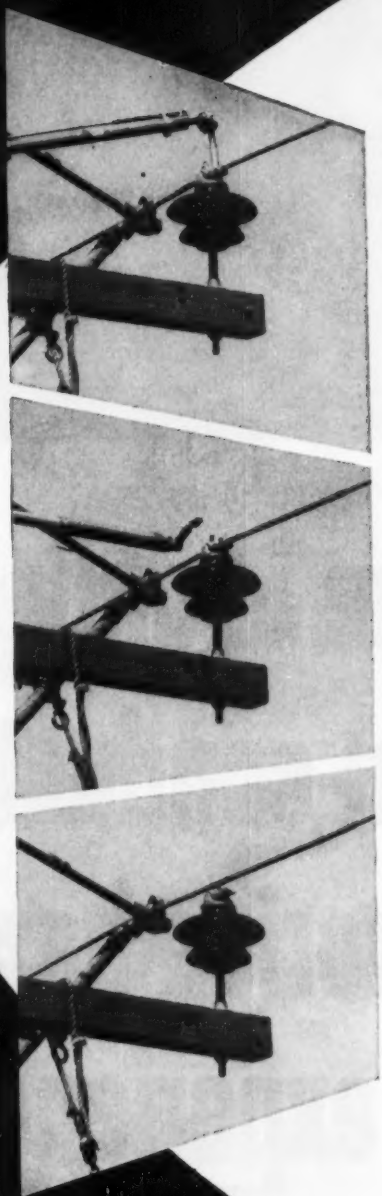
INDUSTRIAL BRIEFS

Curing rubber cement in infrared oven at Cincinnati Industrial Finishing Co, Cincinnati, Ohio, has increased production and safety, cut rejects and saved valuable floor space. Circular rubber cushions are cemented to annular steel rings 9 in. in diameter. This assembly is placed on a hook of the overhead conveyor which carries it through a 50-kw, 240-v, 3-phase infrared oven having two lamp banks. Conveyor speed is set to give 10-min travel time thru the overhead oven. Accurate control of both time and heat results in maximum production and uniform quality product. Infrared lamps are safer than open flame type heating in semi-hazardous atmosphere. L. J. Langevin, Power Engineer, Cincinnati Gas & Electric Co, Cincinnati, Ohio.

Silver soldering spring mechanisms to gauge stems at U. S. Gauge Co, Sellersville, Pa., localizes and controls the heat and prevents annealing the tempered spring mechanisms. A better product is produced in a shorter time which withstands hot air pressures. Tests were made with different types of electrodes and process is now on a production basis. Soldering load totals 15 kw. Paul Britt, Industrial Power Representative, Pennsylvania Power & Light Co, Bethlehem, Pa.

Continuous ignition produced by electric tubular heaters for dust collector system incinerator at Canton Corrugated Box Co, Canton, Ohio, eliminates dust explosion hazard experienced with formerly-used gas flame ignition system. Many of the laminated products supplied customers require sawing to required shapes and sizes. Paper dust and lint thus created is collected by a dust collector system and blown to an incinerator for disposal. The gas flame frequently was blown out by sudden gusts of wind creating a danger of explosion due to gas, dust and smoldering pile. The two hairpin tubular 1200-w heaters were inserted so that falling lint strikes unit and carries ignition to residual pile below. An ammeter installed at service source provides a continuous check of the units' performance. G. W. Craiglow, Industrial Power Engineer, Ohio Power Co, Canton, Ohio.

electrically and mechanically
O-B Clamptops are "tops"



While operating men are more concerned with insulators' electrical characteristics, it's not at all a bad idea to consider mechanical properties, too. Construction and maintenance men are apt to give first consideration to units that are easy to work. Both groups are more than satisfied with the O-B Clamptop. Electrically, it's tops; on par with all O-B products. And with men who've "used them all", the O-B clamping method is preferred. Here are three practical reasons why this is so:

1. Locking nuts accessible from top. Thus, insulator orientation on cross-arm is unimportant. Only two nuts to work on installed insulator.
2. Keeper-piece slips over locking bolts readily, even if one nut is left on bolt.
3. Clamp body, lock bolts form stable group; remain in place while conductor is moved.

Anything that simplifies hot line work - safely - is worth considering for your system. O-B Clamptops do just that. Give these practical, *workable* units a trial!

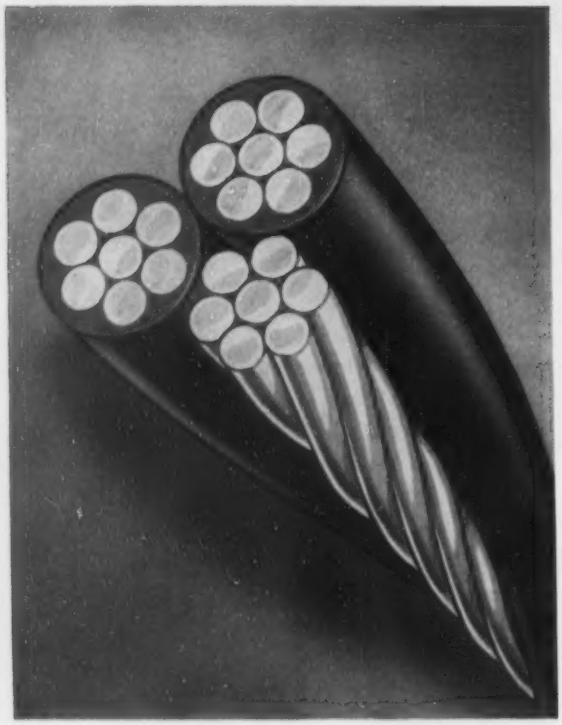
Ohio Brass

MANSFIELD OHIO, U.S.A.

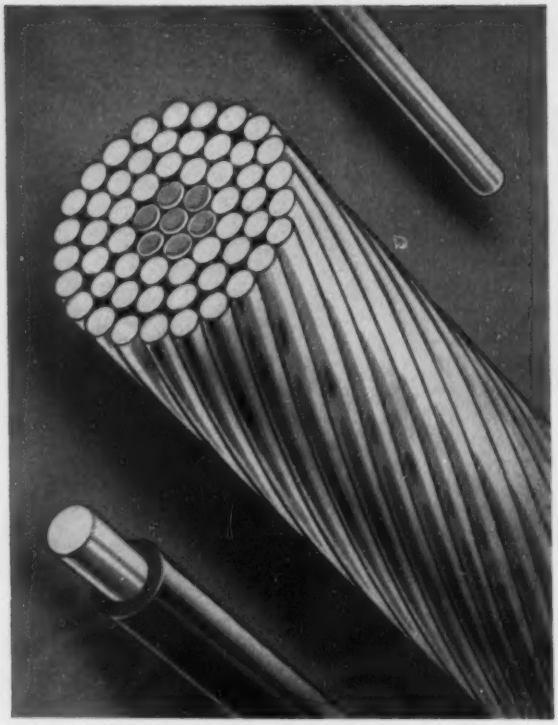
IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

4439-H

ACSR and All-Aluminum Wire and Cable

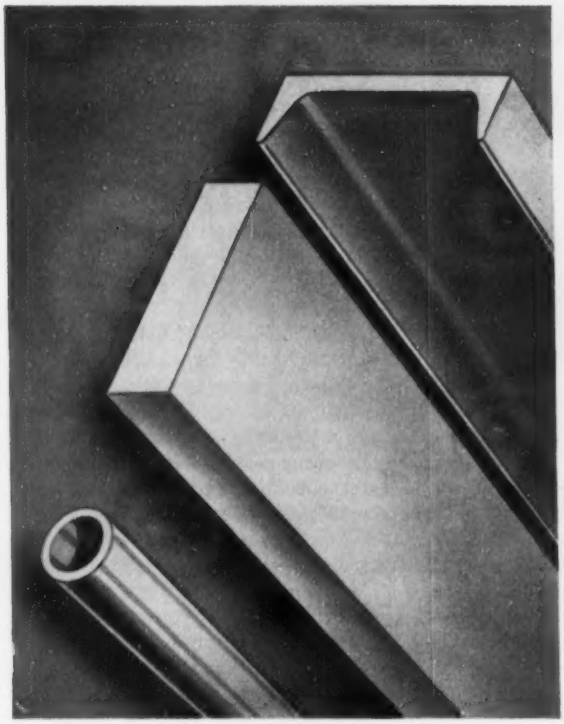


Covered Wire and Service Drop

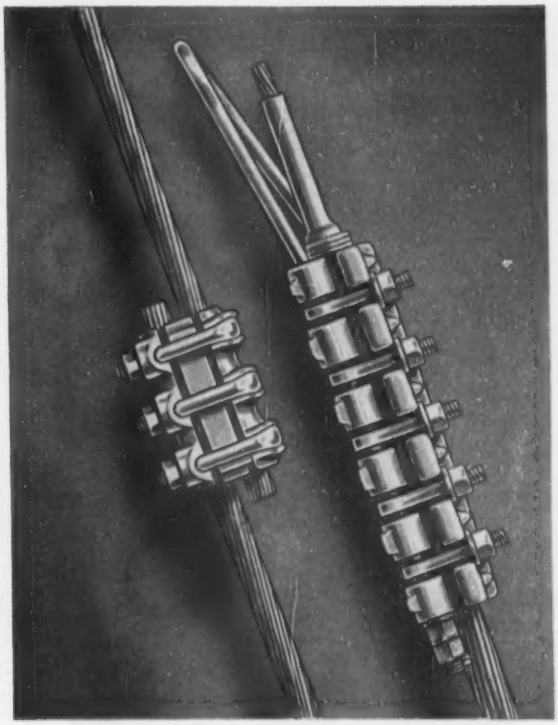


There is only ONE transmission conductors, accessories backed experience...

Rectangular and Tubular Bus



Fittings and Accessories



complete line of aluminum distribution conductors and by 56 years of

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

Range Trade-ins . . .

Low-use customers buy employees' used models in novel Kentucky Power Co plan

Even though 1953 had been its most successful year in history for appliance sales, Kentucky Power Co still had a problem: how to reach the low-use customer who wanted an electric range but whose economic situation would not permit him to buy one?

Kentucky Power, a good part of its residential load devoted to rural mountain folk with lower incomes, felt there were still too many of this type of customer. It knew from a survey that it had a number of sure-thing prospects who would buy a good used range at a low price.

How it met this market and at the same time put new ranges into its own employees' homes is told by G. A. Weatherton, KP's general commercial manager. He explained it to a group of industry sales executives recently in Louisville, Ky.

"We first took another look at the ranges in use by our employees," said Weatherton. "We found that some 375 ranges were in service in their homes (88% saturation). These ranges were then classified by age groups and by employees who wanted to trade."

Armed with these figures the company induced the distributor and manufacturer to cooperate in an employee special, offering new ranges at what Weatherton called a "kissin' cousin price."

"With this we offered our employees five models of the 1953 line at these trade-in allowances for their old ranges: $75 for those bought prior to 1946; $100-1946 to 1949; $150-1950 and later models. An employee who had a range purchased between 1946 and 1949, for example, could buy a new single oven range with deep well cooker, three surface units, lamp and timer for a balance of $56. (Under our employee financing plan they could have terms of 3% down and 36 months to pay.) Only strings attached were that the old range had to be clean and in good operating condition. The offer ran for 90 days."

The results: 136 ranges were turned in and 136 new ones sold.

"Of these, only three were junked," he said. "This left us with 133 ranges to sell to our used-range customers, and we sold them all. Thus 133 electric ranges went on our lines replacing coal, gas, wood and bottle gas. And they went on our lines several years ahead of time."

What did the range trade-in program cost? Weatherton answers by saying the company made a net profit of $1,810 plus the annual revenue that these ranges will bring in—estimated at $4,000.

4-H Meet Set Dec. 1

Fourth Annual Power Suppliers' Conference on the 4-H Electric Program is slated for Dec. 1 in Chicago at Conrad Hilton Hotel. Conference, sponsored by Westinghouse Electric Corp, will discuss ways in which power suppliers can cooperate with 4-H club program.

Latest Electrical Code Handbook Ready Soon

Eighth edition of Abbott's "National Electrical Code Handbook" will be published this month, announces McGraw-Hill Book Co.

Revised to cover the latest National Electrical Code, the book has been prepared by Charles L. Smith, electrical field engineer of the National Fire Protection Association, the organization originating the code.

Contents include rulings for wiring design and protection, wiring methods and materials, general equipment, public occupancies, special equipment and conditions, communication systems, and construction specifications. A final section includes tables, diagrams, and examples, plus an appendix clarifying National Electrical Code Committee's rules of procedure.

Handbook sells for $7.50. Copies are available from McGraw-Hill Book Co's Book Information Service, 327 W. 41st St., New York 36, N. Y.

Pfaff & Kendall Photo

New Lights—While You Wait

Poles and brackets were erected in three days, and lights were turned on within two weeks on this new lighting system along the Bradley Beach, N. J. boardwalk. Installation was made by three men who worked against time to meet resort's summer season opening. The mile-long system consists of 37 mercury-vapor units mounted on 6-ft tapered elliptical brackets and attached at 30-ft heights to all-aluminum standards. Poles have attached transformer bases. Brackets are equipped with ladder rests.

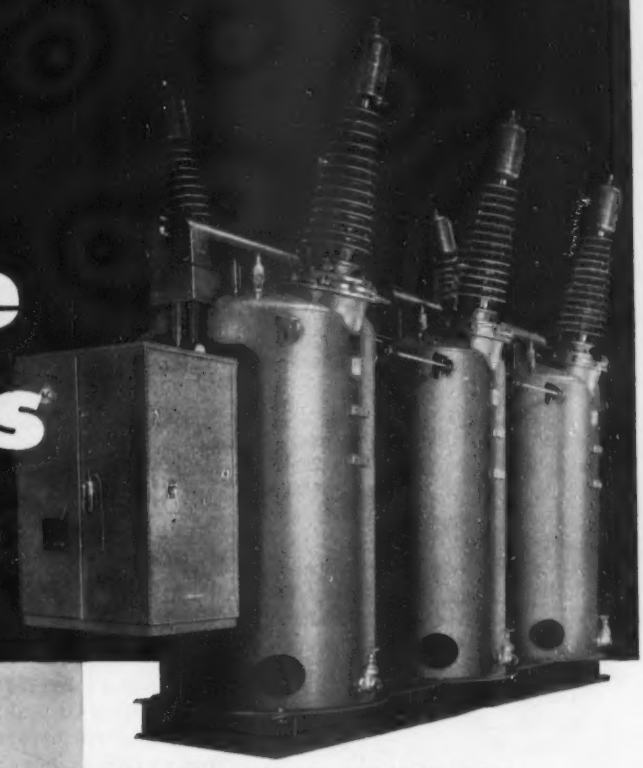
ALLIS-CHALMERS

PROGRESS IN

Switchgear

compare breakers

get the breaker with ALL the important features



HERE'S A COMPARISON OF HIGH VOLTAGE BREAKERS

FEATURES	Allis-Chalmers Breaker	Breaker X	Breaker Y	Breaker Z
Pneumatic Operator	Yes	Yes	Yes Under certain conditions	No
Mechanically trip-free	Yes	No		*
Electrically trip-free	Yes	Yes	Yes	*
Hydraulic Operator	Yes	No	No	Yes
Mechanically trip-free	Yes	*	*	No
Electrically trip-free	Yes	*	*	Yes
Electrically Tested —				
Laboratory	Yes	Yes	Yes	No
Field	Yes	Yes	Yes	Yes

*Not Applicable

Allis-Chalmers reliable breaker performance is based on more than 50 years of circuit breaker design, manufacturing and field experience.

Get complete engineering information! Call your nearby Allis-Chalmers district office, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-4290

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

Farm Conference Future Rests on Nov. 18 Meet

The National Farm Electrification Conference will resume its annual programs this year with a two-day meeting at Schenectady, N. Y., Nov. 18 and 19.

Sure to be discussed by the Conference Steering Committee on the evening preceding, will be a plan to revitalize the conference and put it on a year-round basis. This would be carried out, reports a conference announcement, by appointed task groups who would work in the various fields of farm electrification such as market research, sales distribution, economics, safety, etc.

Problem of continuing the conference, said the announcement, "is complicated by activities of the new Inter-Industry Farm Electric Utilization Council which, to some extent, parallel the work of the Conference."

The major difference, it pointed out, is that the Inter-Industry Council is primarily a rural sales and loadbuilding effort, whereas the Conference directs itself along educational lines.

"The problem posed is whether it is more desirable to sell farm electric equipment directly or to promote its use and later possible eventual purchase through the educational approach. That is the question the Steering Committee will be called upon to answer."

New EEI Folder Promotes Appliance Sales Careers

To stimulate interest in appliance selling as a career, Edison Electric Institute is offering a new folder to the industry,—"New Opportunities for You in the Field of Electric Appliance Selling."

Released by EEI's Sales Personnel and Training Committee, it is designed for use by electric utilities, dealers, electric leagues, manufacturers, employment agencies, job counselors, and educational groups.

The folder is an adjunct to EEI's present Appliance Sales Training Course. It can be imprinted or stamped locally with company or organization name. Quantity orders may be placed with EEI's Commercial Department, 420 Lexington Ave., New York 17, N. Y.

TWIN ELECTRIC RANGES with overhead broilers speed food service at GM Center

GM's Steaks, Like Cars Roll Off Production Line

WILLIAM M. BUSH, Commercial Sales Department Cleveland Electric Illuminating Co, Cleveland, Ohio

Guests don't wait for their steaks in the cafeteria at General Motors Corp's new Parma (Ohio) Training Center. They get them sizzling hot the moment they sit down.

A chef, given a 15-min start, can begin continuous serving of 200 steaks and keep them coming without delay. They veritably roll out of the Center's all-electric kitchen like cars off a GM production line. Up to 66 of the eight-oz. size can be broiled in 12 min, the full 200 in 25 to 30 min.

Secret of this speed in food service lies in the kitchen's compact twin electric range setup. Each has a salamander or broiler mounted overhead with three individually-controlled grills plus a spacious broiling-roasting oven. Result: ten different cooking or warming operations at once, each at its own specific heat level.

Besides this, the chefs like the exact temperature control, uniform cooking results, automatic range features and cleanliness.

Kitchen covers an area of 586 sq ft. Other electric equipment includes a 14-cu ft food freezer, eight-gal coffee maker, 65-cu ft refrigerator, fry kettle, dishwasher, garbage disposal and counter food warmers. Highly flexible in operation, it can serve banquets or snacks, hamburgers or brandied chicken all at the same time.

S & S Shorts

Jet Roars

"Operation Jet," Puget Sound Power & Light Co's '54 load building program has pushed average kwhr consumption per residential customer up 11.4% for 12 months ending Aug. 31 over same period last year. Annual revenue per residential customer has increased 7.4%.

Operation Snowflake

Some 75 utilities have indicated they will support U. S. Steel Corp's "Operation Snowflake" appliance promotion program. To help the steel-using appliance manufacturers to sell more goods, U. S. S. is conducting a heavy Christmas advertising program.

Shorties . . .

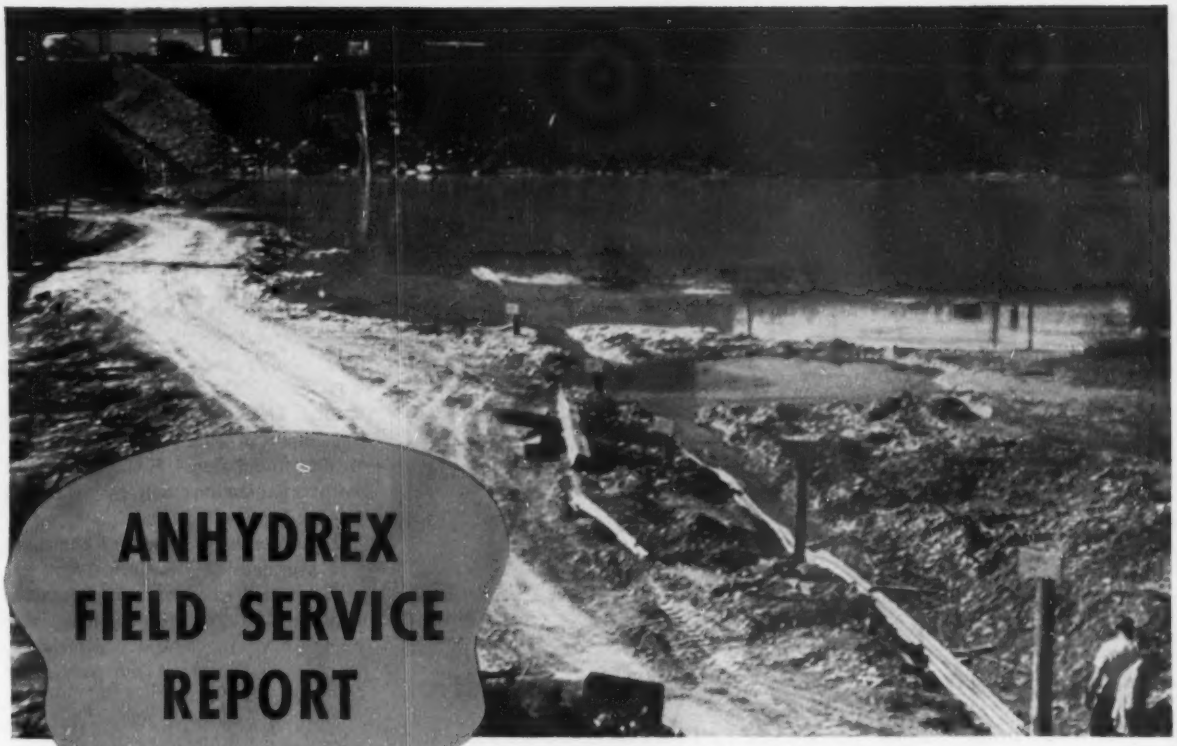
Freezer owners who have had both kinds prefer the upright to the chest type by a majority of ten to one, reveals a survey made by Hotpoint Co . . . Union Electric Co of St. Louis is conducting a series of four monthly dinner meetings for the home building industry during the winter season.

Sacramento Liberalizes Water Heater Specs

Sacramento Municipal Utility District has liberalized specifications for electric water heaters to qualify for a special low rate.

The rate schedule which became effective Oct. 1 states:

The rate of 8 mills per kwhr for energy used between 600 and 1,500 kwhr per bi-monthly period is applicable to domestic service where one or more approved double element water heaters are installed on the premises and served through the same meter with other domestic requirements. To qualify as an approved water heater, each water heater must (a) be thermally insulated, (b) have a total tank capacity of not less than 40 gallons, (c) have each heating element separately controlled by an individual thermostat located as close as practicable to the element it controls, and (d) have heating elements which, under maximum operating conditions, will not establish a total demand of more than 4.5 kw at any one time.



ANHYDREX FIELD SERVICE REPORT

PROBLEM: Maintaining uninterrupted electrical service during replacement of bridge and pole lines.

SOLUTION: Simplex Anhydrex-insulated, nonleaded, neoprene-jacketed Power Cables, protected by submarine-cable armor wire.

METHOD: A wire-rope messenger was strung across the 600-foot river and pulled taut between two line trucks. A steel snatch-block was arranged so that the sheave rode the messenger. Cable ends were attached to the block hook. Leader rope was also attached to the hook, and the cables pulled across with the sheave rolling on the messenger. A line truck winch supplied pulling power.

Cable ends were pulled into conduit on both river banks. They were terminated in potheads on one side, and spliced to existing circuits on the other side.

When the new bridge was finished, the cables were removed from the river bottom, armor wire was stripped off, and the cables were reinstalled in conduit on the bridge.

Simplex-Anhydrex is one of the most water-resistant electrical cable insulations made. It is guaranteed not to absorb more than 15 milligrams of water per square inch after 7 days at 158°F. *No Anhydrex-insulated cable has ever failed from water absorption.*

A post card to the address below will bring more information. No obligation, of course.

Simplex—ANHYDREX POWER CABLES

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

MANUFACTURERS AND MARKETS

Magnatran in New Plant, Ups Production

A new transformer plant provides enlarged production facilities for Magnatran, Inc, at Kearny, N. J. At the formal opening, Walter J. Garlick, president, noting the upward trends in demands, stated that buying interest concentrated in two completely separate areas—conventional power distribution and special heavy duty electronic applications.

In this new plant production will be substantially increased in medium size distribution and power transformers (100 to 5,000 kva). Special transformers of greater power capacity will also be produced to meet requirements by microwave, television and communication equipment manufacturers.

The new plant, designed for manufacture of transformer equipment, provides 20,000 sq ft of production area with provision for future expansion. A traveling crane serves the entire production area. At the front is a one-story structure housing the executive, designing, and small equipment departments. High intensity mercury vapor and incandescent fixtures provide a minimum of 40 ft-c of illumination at floor level. In electrical distribution each branch circuit is served by its own transformer and circuit breaker.

Kuhlman Purchases Plant in California

Purchase of a California plant and expansion of its Michigan factory and office space have been announced by Kuhlman Electric Co of Bay City, Mich.

The company has entered into an agreement to purchase the assets and machine plant operations of State Metal Fabricators, Inc, Salinas, Calif. The sale is scheduled to become effective on Nov. 15. Details of the sale were not revealed.

Kuhlman officials have stated that the California property will be operated as a Western Division branch plant. Company headquarters will remain in Bay City. The company proposes to continue some of the machine plant's operations and utilize the property for manufacturing small transformers and warehousing.

On the occasion of Light's Diamond Jubilee and the Company's 60th anniversary, Kuhlman broke ground for a 10,000 sq ft factory and office addition at Bay City. The company manufactures power and distribution transformers and electric furnaces.

Kuhlman has recently expanded its sales coverage on the Pacific Coast (EW, Nov. 1) and has a Southern Division branch plant in Crystal Springs, Miss.

Research-Cottrell, Inc To Handle Precipitators

Research-Cottrell, Inc. has taken over the engineering, manufacturing and sales of Cottrell electrical precipitators. The firm is a wholly owned subsidiary of Research Corp, a nonprofit foundation. Headquarters of both organizations will be in Bound Brook, N. J.

Dr. Joseph W. Barker, chairman and president of Research Corp, has been elected chairman of Research-Cottrell, Inc. Howard Coonley, vice president of the parent organization, is vice chairman of the subsidiary company.

Carl W. Hedberg, formerly vice president of Research Corp and general manager of its Precipitation Division, has been elected president of the new firm. L. M. Roberts, formerly director of engineering, and P. F. Eilenberger, formerly director of manufacture, have been elected vice presidents of Research-Cottrell, Inc. James M. Knox and J. William Hinkley, vice presidents of Research Corp, have been elected treasurer and secretary respectively of the new firm.

Separation of the precipitation business from Research Corp's grants and related functions will provide clear-cut distinctions between the industrial and the eleemosynary activities of the foundation. Research Corp will continue to receive the net earnings of the precipitation activities.

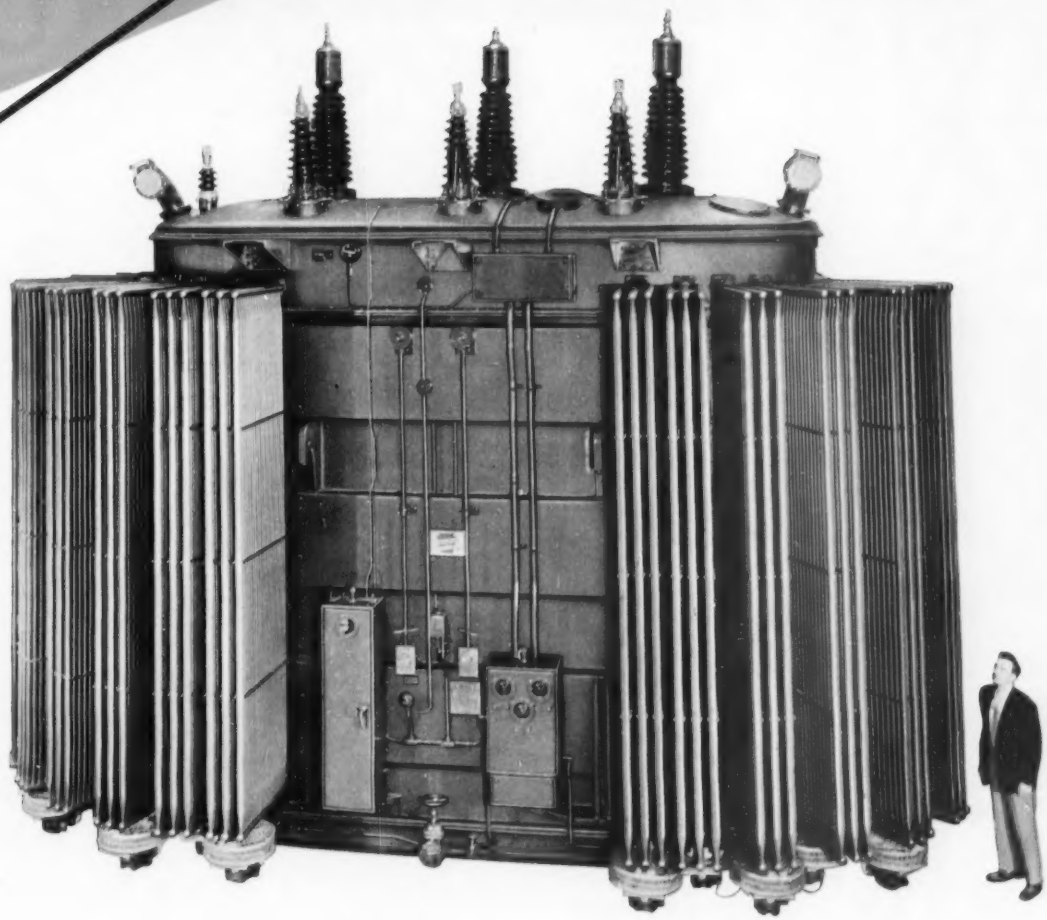
Square D's Earnings

Although it had a crippling 108-day strike at Detroit, Square D Co has announced consolidated earning amounting to $3,134,428, or $2.28 a share, for the first nine months this year. During the same period last year consolidated earnings totaled $3,228,578, or $2.35 a share. The company has seven U. S. plants and others in Toronto and Mexico City.

(*More M&M on page* 188)

100,000 Kva THREE PHASE

Pennsylvania Auto Transformer



Tying in a 69 Kv system to a 138 Kv system is the function of this 100,000 Kva forced-air cooled Pennsylvania Power Transformer. When operating without fans, the transformer carries a rating of 60,000 Kva. With ½ of the fans in operation, the transformer will deliver 80,000 Kva. In addition to a high voltage rating of 132,000 volts and a low voltage rating of 67,700 volts, the transformer has a tertiary voltage of 2400 volts at 13,100 Kva.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division • **CANONSBURG, PA.** • *Greater Pittsburgh District*

For inside story see next page . . . .

Inside a 100,000 Kva *three phase*

Pennsylvania Auto Transformer

Tap changers are mounted above core and coils where they are easily reached through large manholes in the tank cover.

Tap leads are connected to straight line tap changers through heavy pressboard tubes.

Two sets of taps per coil assure proper electrical and mechanical balance in the high voltage windings.

Coils are precompressed with a force equal to the highest short circuit stress and built into transformer at the compressed dimension. This prevents mechanical distortion of the coils if short circuit stresses occur.

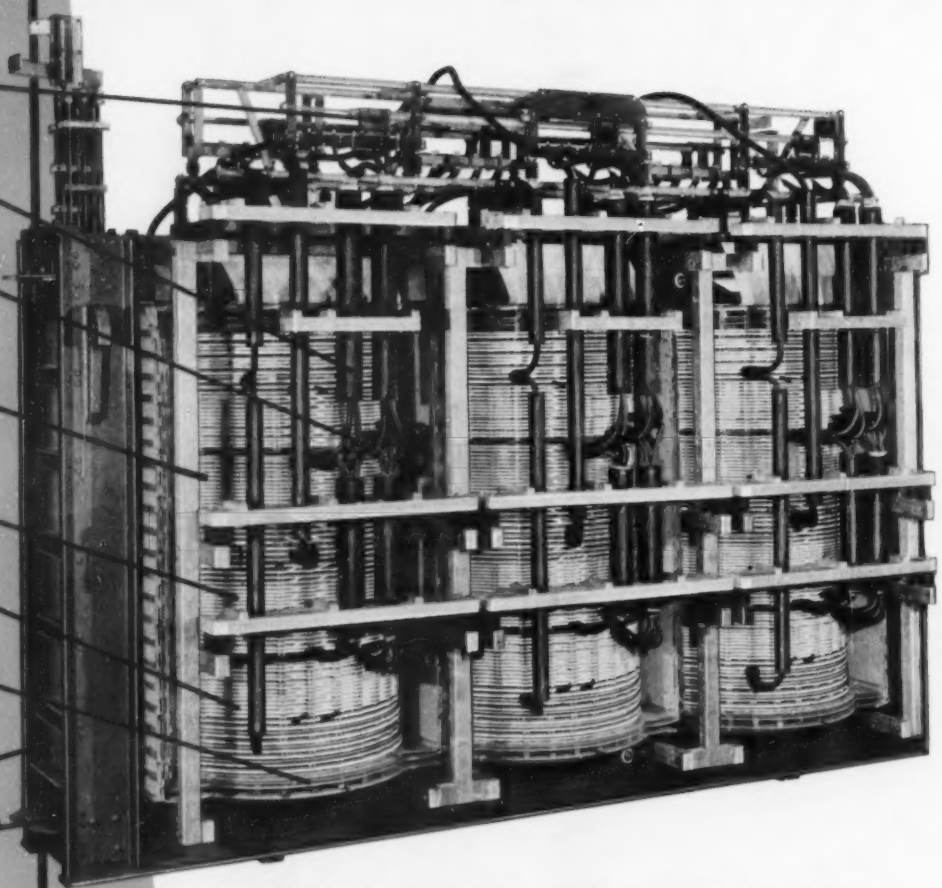
Circular coils electrically balanced both radially and axially against short circuit stresses.

Continuous pancake windings in high voltage and low voltage coils. Helical windings in tertiary coils.

Line ends of coils are heavily insulated to provide extra protection against surge voltage stresses.

Five-legged core reduces height of transformer.

Guide plates fix the position of the core and coil assembly in the tank.



60,000/80,000/100,000 Kva, Three Phase, 60 Cycles, 55°C. Temperature Rise. Forced-air cooled.
High voltage: 132,000 Grd.Y • Low voltage: 67,200 Grd.Y
• Tertiary voltage: 2400Δ (13,100 Kva).

◀ external view of transformer
see other side

PENNSYLVANIA TRANSFORMER COMPANY
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to 50,000 units daily by early next year.

Plans call for making another smaller thumb size alarm device to be installed on radios, alarm clocks, reading lamps, and television sets.

MANUFACTURING BRIEFS

Underwriters' Laboratories, Inc, Chicago, has released a Bulletin of Research, No. 48, entitled "Aluminum Building Wires and Connectors." It reports information on building wires employing aluminum instead of copper as conductors, and on solders and pressure wire connectors used for making joints.

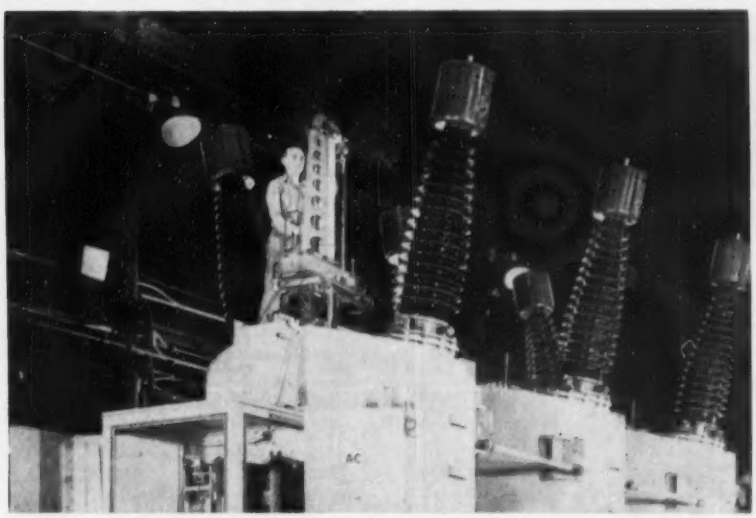
International Nickel Co of Canada, Ltd, has begun the first commercial production of electrolytic cobalt in Canada. Production is at its Port Colborne, Ont., refinery.

U. S. Rubber Co's Naugatuck (Conn.) Chemical Div reveals a plastic able to withstand heat. It is a laminate made with glass cloth and three different resins: maleic alkyd, triallyl cyanurate (TAC), and diallyl bicycloheptene dicarboxylate (DET). After 8 days at 500 F, the plastic withstood bending force of 30,200 psi.

Canadian Johns-Manville, Ltd, has expanded mine and mill operation at Asbestos, Que. Production has started in a new mill. The Jeffrey mine is to produce at the rate of 625,000 ton yearly. This is one third of the world's annual production. Reserves are sufficient for 100 yr at this rate.

Fluorescent Fixtures of California expects its new plant and offices in South San Francisco to be completed about December 15. Building will provide 66,000 sq ft working area and the 107,000 sq ft lot provides for future expansion. The 10-year old company has moved four times to accommodate growth. The firm employs 185 people and maintains plants in Los Angeles and Portland as well as San Francisco.

Westinghouse Electric Corp's 14,000-page catalog will be rewritten and redesigned and cut to about 9,000 pages. Fuller & Smith & Ross, Inc., of Cleveland 15, Ohio, will do the work. Completion of the job is estimated to require 2.5 years.

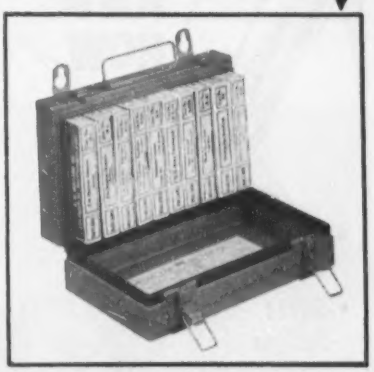


10,000-Mva, 230-Kv Breaker Shipped

Allis-Chalmers Boston Works has shipped a 230-kv, 10,000,000-kva breaker for installation on a western power system. It is claimed to be the first hydraulically-operated 230-kv breaker. Each pole utilizes a 3-cycle Turbo Ruptor mechanism in a tank designed for minimum oil. Overall height of the breaker, base mounted, is 18 ft and weight is 82,000 lb. The breaker is shown on the test floor at the Boston Works set up for speed-graph tests.

Why buy all this ↓

when you need only this ↓



Hundreds of dollars are being saved yearly by users of Bullard First Aid Kits. Bullard's wide selection of standard kits planned to meet the accident patterns of specific industries means you get the benefits of custom designed kits without paying premium prices. Write today for the new Bullard First Aid catalog . . . discover how you can save spoilage and waste resulting from unused and unnecessary first aid supplies.

Send me your new folder, *"Custom Designed First Aid at standard prices."*

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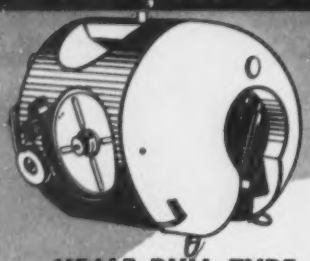

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Alcoa to Generate Power at Chilhowee

A new dam and hydroelectric generating facilities costing $10 million are planned by the Aluminum Co of America, according to Ralph M. Ferry, general manager of the company's Tennessee operations. Construction will be at the Chilhowee site on the Little Tennessee River, under an agreement with the Tennessee Valley Authority.

The dam will have a maximum height of 82 ft and a length of about 1,400 ft. The reservoir will be about 9 miles long. The power house will have three generating units having a total capacity of 70,000 hp.

Electric power made available to Alcoa will be used for aluminum smelting and fabricating at the company's Alcoa (Tenn.) works.

Duro-Test Acquires 10 Hg-Lamp Patents

Ten basic patents relating to mercury vapor and color-improved high-intensity mercury lamps have been acquired by Duro-Test Corporation, North Bergen, N. J. According to Walter H. Simson, president, these patents are now being used by leading manufacturers here and abroad.

These patents are a few of the many inventions by Michel E. Macksoud, inventor in the field of illumination, electronics, and communication. Macksoud will work on development of new products in the company's recently expanded research laboratory. The research program includes work for the government, Xenon super-pressure lamps, krypton and mercury for commercial use, and nuclear physics pertaining to lamps.

Air Raid Warning Unit Has Carrier Alert

An air raid warning device for homes that is set off by a signal over distribution lines will be marketed soon under the name Hom-A-Lert. The device, about the size of two cigaret packs, plugs into any convenience outlet. It is designed to give a warning buzz when energized by a 300-cycle signal received over the distribution circuits.

According to the designers, control of the device would be similar to the system used by some power companies to control switches on electric water heaters during peak-load periods. The signal generators could be installed at power company distribution substations. As yet, development of the master generators and means for energizing them has not been worked out.

The warning device includes a capacitor, a rectifier, and buzzer. It would use no power until activated by the 300-cycle signal.

A corporation, as yet unnamed, is to be formed in San Francisco to manufacture some 15,000 units a day, with plans for stepping up production

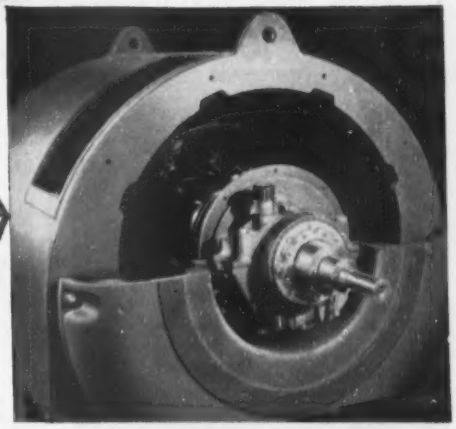
MANUFACTURERS' EARNINGS

Company	Period Months	Period Ended	Net Income 1954	Net Income 1953	Earnings Per Common Share 1954	Earnings Per Common Share 1953
Allis-Chalmers Mfg Co	9	Sept 30	$19,323,469	$15,150,429	$5.53(a)	$4.83(a)
Buffalo Forge Co	3	Aug 31	487,650	432,066	0.75	0.67(b)
Carpenter Steel Co	3	Sept 30	444,130	1,048,070	1.03	2.45
Colorado Fuel & Iron Corp	3	Sept 30	1,027,096	2,483,797	0.33(a)	0.94(a)
Dow Chemical Co	3	Aug 31	8,544,028(c)	9,762,957	0.36(a)	0.43(a)
Elliott Co	9	Sept 30	1,521,339	1,935,175	2.43	3.20
General Electric Co	9	Sept 30	140,691,000	116,386,000	1.62	1.34(b)
Gould-National Batteries	3	July 31	627,394	684,700	0.84	0.95
International Business Mach	9	Sept 30	33,575,088	24,092,078	8.19	5.88(b)
Johns-Manville Corp	9	Sept 30	12,711,589	15,850,435	4.00	5.00
Kaiser Aluminum & Chem	3	Aug 31	5,328,000	3,458,000	1.29	0.85
Koppers Co, Inc	9	Sept 30	4,624,602	6,678,550	2.16	3.34
P. R. Mallory & Co	9	Sept 30	521,048	2,157,739	0.44	3.18
Minneapolis-Honeywell Reg. Co	9	Sept 30	3,123,363	2,829,886	3.39	2.50
Monsanto Chemical Co	9	Sept 30	16,445,881	19,687,960	3.04	3.65
Okonite Co	9	Sept 30	701,866	2,082,373	4.11	12.95
Radio Corp of America	9	Sept 30	27,557,000	25,152,000	1.80	1.62
Reynolds Metals	9	Sept 30	14,804,324	15,704,253	7.78	8.24(b)
Shell Oil Co	9	Sept 30	89,544,914	81,480,515	3.26	2.97(b)
Texas Co	9	Sept 30	151,880,195	133,352,687	5.53	4.85
Union Carbide & Carbon	9	Sept 30	63,145,879	78,897,595	2.18	2.72
Worthington Corp	9	Sept 30	5,390,608	4,607,832	4.04(a)	4.00(a)

Note—(a) Based on shares outstanding at close of respective periods. (b) Based on shares now outstanding. (c) After deducting approximately $5 million of rapid amortization.

new DESIGN...

more protection with full accessibility



New Allis-Chalmers slip-ring motor with inspection cover and upper half of end shield removed. Note accessibility of brushes, protection of bearing.

ALLIS-CHALMERS LARGE SIZE SYNCHRONOUS AND WOUND-ROTOR MOTORS have been completely redesigned with longer stator yokes and shorter end shields. Collectors and brushes are located inside the yoke for protection against physical damage, dripping moisture, dust and dirt.

Capsule-type bearings give better bearing protection, too. The upper half of the end shield may be removed for inspection or cleaning of the interior of the motor without disturbing the exciter or exposing the bearing to the ravages of dirt, dust and oil contamination.

All leads enclosed — Both primary and secondary winding leads are brought out through separate conduit boxes. There is no loose wiring . . . no exposed leads anywhere.

Easy maintenance — Even though the new design offers maximum protection to brushes and collectors, internal parts are fully accessible for inspection and maintenance through large openings in the stator yoke. Opening covers are readily removed and are secured during operation by easy-operating, self-locking fasteners.

Get details now — This new design is available from approximately 250 hp at 300 rpm and up, in drip-proof and splash-proof construction. Call your Allis-Chalmers representative for complete details or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 05R8183. A-4464

ALLIS-CHALMERS

Crapo
GALVANIZED STEEL
STRAND

Strong...
to support pole structures under adverse ice and wind loadings.

Rugged...
to withstand the punishment incurred in construction and service.

Long-Life...
provided by famous *Crapo* Galvanized heavy, ductile, tightly-bonded zinc coatings.

-and Economical, Too!

● Each size and grade of time-proved *Crapo* Steel Strand utilizes the superior tensile strength of steel to the fullest advantage. Next time, *specify Crapo Steel Strand* for guy, messenger and overhead ground wires . . . and *save on maintenance!*

REINFORCE and PROTECT YOUR CONDUCTORS with Preformed ARMOR RODS

Minimize wear and chafing . . . Absorb and dissipate vibration . . . Protect against arcing and flash-overs . . . Increase holding power against slippage . . . Lessen possibilities of corrosion . . . *Reduce overall maintenance costs.*

Contact your jobber of *Crapo* Galvanized Products or write direct for further information!

INDIANA
STEEL & WIRE COMPANY
MUNCIE, INDIANA

SALES ASSIGNMENTS

COMPANY STAFFS

Babcock & Wilcox Co's Tubular Products Division has named Ray E. Fleeson to the sales staff of its Chicago district office. Fleeson, who became associated with Babcock & Wilcox in 1933, has been in charge of the Cleveland sub-office of the Beaver Falls, Pa., district sales office since 1946.

Line Material Co, Milwaukee, has named Robert E. Deal to the position of apparatus engineer in its South Atlantic Division. From L-M's Atlanta office, Deal will handle North and South Carolina, Georgia, and Florida. Deal replaces Harry F. Naramore, who was transferred to L-M's East Central Division. Naramore will operate in Ohio, Michigan, Indiana, and Kentucky from the Cleveland office. He assumes the apparatus engineering duties of George W. Cooper, recently promoted to manager of protective and switching equipment sales.

International Harvester Co's Motor Truck Division has made these changes: J. O. Lambeth, formerly district manager at Charlotte, N. C., was transferred to Nashville, Tenn., to fill a similar post. C. T. Helin, formerly district manager at Houston, Tex., was transferred to Charlotte to succeed Lambeth. Formerly district manager at San Antonio, Tex., P. C. Johnson goes to Birmingham, Ala., to serve in the same capacity. New district manager, at Houston is J. S. Turner, previously assistant district manager at Shreveport, La. H. T. Rosell, formerly assistant manager at San Antonio, was named Johnson's successor as district manager in that office. Hugh Hanks, formerly assistant district manager at Lincoln, Neb., was transferred to Omaha to assume a similar post. J. M. Coyle, previously sales promotion supervisor of the Omaha district, was appointed assistant district manager at Lincoln.

General Electric Co's Air Conditioning Division has appointed Leland D. Krape as field sales representative with offices in Dallas. Krape, who will report to regional manager E. J. Guillory in New Orleans, will handle home heating and cooling department products in the division's South Central region. Prior to the present appointment he was the division's product service representative in the Dallas area.

Electric Storage Battery Co's Exide Industrial Division has announced these promotions: Charles H. Leet, Pittsburgh branch manager since 1949, was transferred to the firm's larger Chicago office as assistant branch sales manager. R. L. Kegg, formerly branch sales engineer at Pittsburgh, replaces Leet as branch sales manager there.

Minneapolis-Honeywell Regulator Co named Harry E. Grossman manager of its Washington, D. C., branch and Joseph H. Nixon head of the firm's Grand Rapids (Mich.) district office. Grossman formerly was manager of Honeywell's Harrisburg, Pa., office and Nixon previously was senior commercial salesman in Saginaw, Mich. In other changes, Wayne F. Kelly, formerly senior commercial salesman in Youngstown, Pa., replaces George Dieter as manager of the Spokane (Wash.) branch. T. S. Bolling was assigned to the Charleston, W. Va. district office and Charles W. Prey, previously head of commercial sales activities in Baltimore, was made head of the Harrisburg district office. Additional field assignments call for Leight M. Johnson, former senior commercial salesman in Philadelphia, to go to Harrisburg as branch commercial sales manager. Raymond A. Metz, former senior commercial salesman in Wilmington, Del., assumes a similar post in Philadelphia.

MEETINGS CALENDAR

***EDISON ELECTRIC INSTITUTE**
Industrial Power and Heating Section, Hotel Statler, Cleveland, Nov. 15-16; Industrial Relations Committee in conjunction with North Central Electric Association, Minneapolis, Minn., Nov. 18-19; Wiring and Specifications Committee, St. Louis, Nov. 29-30; Prime Movers Committee, Astor Hotel, New York, Nov. 29-30; Commercial Electric Space Heating and Air Conditioning Committee, Cleveland, Dec. 2-3; Street Lighting Committee, Boston, Dec. 7-8; Commercial Cooking and Water Heating Committee, Jefferson Hilton Hotel, St. Louis, Dec. 8-10; Industrial Relations Committee, EEI Headquarters, New York, Dec. 16; Industrial Relations Committee, EEI Headquarters, New York, Jan. 20; Prime Movers Committee, Grand Hotel, Mobile, Ala., Jan. 31-Feb. 1, 1955.

AMERICAN STANDARDS ASSOCIATION
36th Annual Meeting and 5th National Conference on Standards, Hotel Roosevelt, New York, Nov. 15-17.

WISCONSIN UTILITIES ASSOCIATION
Electric-Gas Sales and Engineering Convention, Schroeder Hotel, Milwaukee, Nov. 17-19.

NATIONAL FARM ELECTRIFICATION CONFERENCE
1954 Meeting, Van Curler Hotel, Schenectady, N. Y., Nov. 18-19.

PACIFIC COAST ELECTRICAL ASSOCIATION
Joint Fall Conference of PCEA's Administrative Service Section and Accounting Section of Pacific Coast Gas Association, Sir Francis Drake Hotel, San Francisco, Nov. 18-19; Business Development Section, Hotel Californian, Fresno, Calif., Jan. 27-28, 1955.

NEW JERSEY UTILITIES ASSOCIATION
Annual Meeting, Seaview Country Club, Absecon, N. J., Nov. 19.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Annual Meeting, Statler Hotel, New York, Nov. 28-Dec. 3.

PUBLIC UTILITIES ADVERTISING ASSOCIATION
Annual Meeting, Region 2, St. Moritz-on-the-Park, New York, Dec. 2-3.

21ST NATIONAL POWER SHOW
Sponsored by American Society of Mechanical Engineers, Commercial Museum, Philadelphia, Dec. 2-7.

EASTERN JOINT COMPUTER CONFERENCE EXPOSITION
Sponsored jointly by American Institute of Electrical Engineers, Institute of Radio Engineers, and Association for Computing Machinery; Bellevue-Stratford Hotel, Philadelphia, Dec. 8-10.

ELECTRICAL EQUIPMENT REPRESENTATIVES ASSOCIATION
Annual Meeting, Breakers, Palm Beach, Fla., Jan. 10-12, 1955.

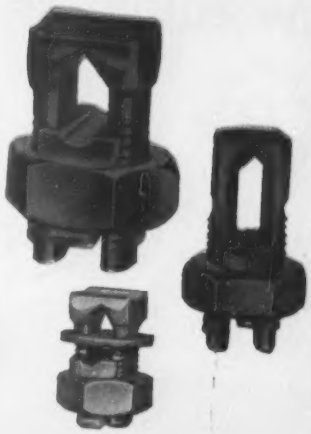
DOBLE ENGINEERING CONFERENCE
22nd Annual Meeting, Sheraton Plaza Hotel, Boston, Jan. 24-28, 1955.

***AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS**
Winter General Meeting, Statler Hotel, New York, Jan. 31-Feb. 4.

* Additions this week.

Get higher conductivity

PLUS PERMANENT TIGHTNESS WITH MATTHEWS SPLIT-BOLT* CONNECTORS



Matthews Split-Bolt Connectors, forged from medium drawn copper, have the same characteristics as the conductor itself. That's why you get high conductivity that reduces line heating, conductor damage, radio and TV interference, and the damaging effect of overloads.

You can screw these split-bolts up tight enough to stay tight without smashing the conductor in a vise-like grip. Torque wrench tests prove that connections made with Matthews Split-Bolts *stay tight* over longer periods of time because both clamp and conductor have the same coefficient of expansion.

*formerly Nutype

Pad swings clear while installing clamp on conductor.

For larger conductors...

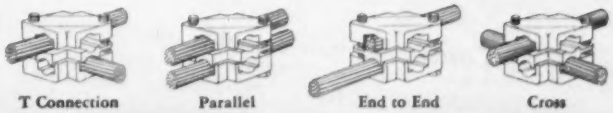
USE THE EASY-TO-APPLY...LOW COST MATTHEWS UNICLAMP

For 1/0 through 1,000 MCM conductor you can save money and get a better, more easily applied connection with Matthews Uniclamps. They cost less than split-bolts in these larger sizes, and they give you a wider contact area plus the extra strength needed on large stranded conductors. Linemen like Uniclamps because they can be installed without taking them apart, and their shape makes them easy to cover with protective tape.

Three sizes are all you need

WHEN YOU USE MATTHEWS MULTITAPS

Substation connections, grounding grids or industrial wiring jobs that call for a wide variety of taps can usually be handled with Matthews Multitaps. These versatile connectors can be used for cross, T, end to end, and parallel connections. The three sizes will accommodate a wire range from #1 stranded up to 1000 MCM on the main line side, and #6 solid to 1000 MCM stranded on the tap side. Multitaps are cast of high strength copper alloy. They have rounded corners for easy taping.



T Connection | Parallel | End to End | Cross

abc INDUSTRIES

CC54-13

A·B·CHANCE CO.

CENTRALIA, MISSOURI · SAN FRANCISCO, CALIFORNIA

NEW EQUIPMENT

Microwave Telephone Link

Microwave telephone link provides two standard telephone circuits up to 50-mi. long over suitable terrain. This model TCR-12 System, called the "Telelink," will provide 20 parties each with their own number—10 on each of the two channels—when used with full selective ringing. Another system is soon to be announced that will provide for facsimile, telegraph, telemetering, and control circuits in addition to voice communication.

The Telelink terminal cabinet houses all components including the 6,000-Mc rf assembly. The cabinet weighs about 270 lb, and is 88 x 75 x 28 in. It may be pole or tower mounted, or a combination arrangement with a passive reflector.

Power required is 115 v, 60 cps, 375 w. Design is for outdoor, continuous unattended operation from −40 to 120 F. Antenna alignment range is ±15 deg in azimuth and ±50 deg in elevation.

Intelligence bandwidth is 250 to 3,500 cps on each channel with overall circuit loss not more than 6 db for two-wire termination. The four-wire termination arrangements has a bandwidth of 16 to 30,000 cps on the first channel and 16 to 4,000 cps on the second channel. Signal level is 0.5 v to transmitter and 3.0 v from receiver.

Emitted energy is 100 milliwatts in the 6,000 Mc band. Channel one frequency modulates the carrier with a peak deviation of 340 kc. Channel two modulates a 65 kc subcarrier with a peak deviation of 8 kc. The parabolic antenna is used simultaneously for transmission and reception—the received signal is displaced 70 Mc from the transmitted signal.

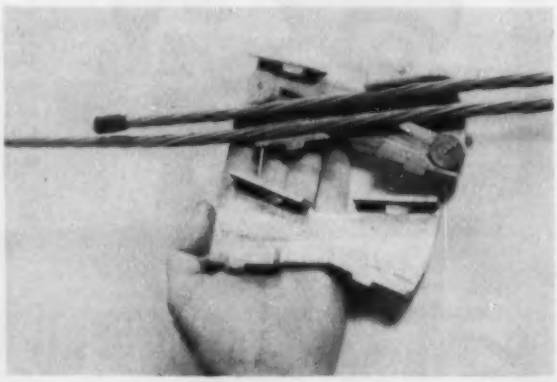
Raytheon Manufacturing Co, Waltham 54, Mass.

Cable Roller Clamp

Roller-grip clamp is designed for use on guy strands and for similar cable installations. According to the manufacturer, the clamp is easy to install, will not slip, and can be reused again. It consists of two covers of hot-dipped galvanized ductile iron that lock together. Two milled, case-hardened, cold-rolled steel rollers fit in slots in one of the covers. These rollers wedge against the cable to hold it in place. Weight of the clamp shown is about 1 lb.

To install the device, the rollers are placed at ends of the slots. Cable ends are put in one cover under one roller in the straight slot. The other cover is replaced and slid sideways to lock. The rollers are tapped firmly into place against the cables and a strain is applied. To remove the clamp, the rollers are driven out to the end of the slots. The cover is slid sideways and lifted up.

In pulling tests on the clamp holding $\frac{7}{16}$-in. steel wire, the cable broke under 12,700-lb tension outside the clamp,



with no damage to the device itself, according to the manufacturer. Standard sizes $\frac{3}{8}$ to $\frac{7}{8}$ in. are available, with other sizes on special order.

Paul S. Everley Co, 550 Ninth St, San Francisco 3, Calif.

Square-Wire Termination

Compression method developed for terminating and splicing square and rectangular magnet wire employs a standard Burndy pneumatic press with a special Magnecrimp die. The die contains both rounding and crimping grooves. Single or bundled magnet wire is pre-rounded by the rounding dies, inserted into the tubular barrel of a standard compression connector, and then crimped together by the crimping die groove.

Pre-rounding insures the correct, most economical terminal or link size for the cross-sectional area of the magnet wire. Magnecrimp die sets and connectors are available for solid, round, square, and rectangular magnet wires in size 26 AWG through 2,000 Mcm.

Burndy Engineering Co, Inc, Norwalk, Conn.

Al-Conductor Alloy

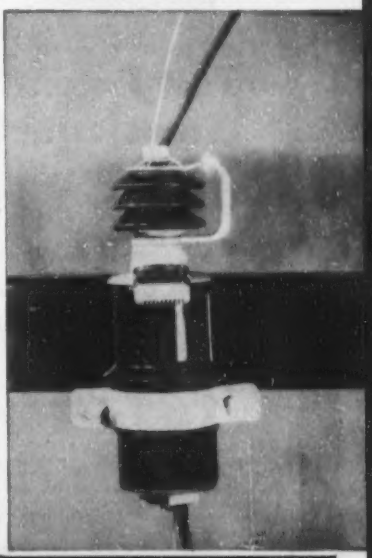
High-strength aluminum alloy for electrical bus conductors, 55EC, combines the strength characteristics of 6063-T6 with conductivity approaching that of EC-H17. The structural strength of 55EC is expected to make it useful in applications where short-circuit forces are high. Its strength also provides a more favorable creep rate. It is available in many structural

Hubbard Autogaps

make the big difference...

CONVENTIONAL ARRESTER

HUBBARD AUTOGAP

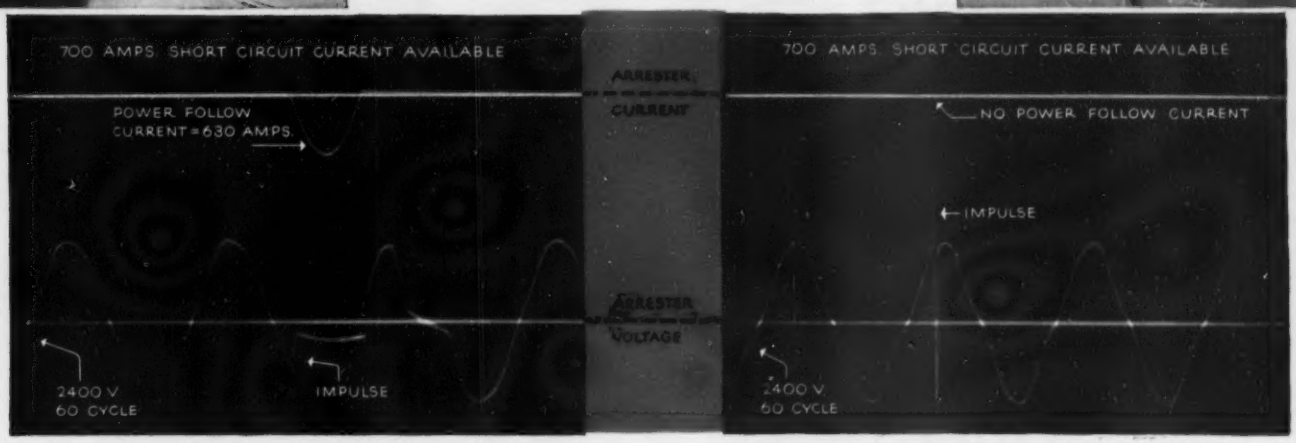


The AUTOGAP is the one lightning arrester available for *all* system conditions. In the twin vented Autogap a unique fibre barrier plug develops adequate deionizing gas pressures from the lightning current, while all other expulsion arresters normally require the additional action of power follow current for equivalent pressures.

The Autogap Arrester has a lightning capacity of 150% of the standard minimum requirements and has a negligible discharge voltage for any lightning current. It is therefore suitable for systems with the most extreme lightning exposure.

Each rating has an impulse sparkover characteristic that provides approximately a 50% safety factor for the new equipment insulation. It is therefore recommended for the protection of all equipment, old or new.

Both arresters illustrated were photographed while under identical test conditions. The "conventional" arrester temporarily shorted the system while the Autogap conducted lightning only.



CONVENTIONAL ARRESTER . . . Above oscillogram and photograph were recorded during a duty cycle test of a 3 KV "conventional" arrester. The large volume of expulsion gases, blowing out the bottom and representing consumed fibre, is a result of the 630 amps. of arrester power follow current. The test shows typical "conventional" arrester duty cycle operation.

HUBBARD AUTOGAP . . . Above oscillogram and photograph were recorded during a duty cycle test of a 3 KV Autogap arrester. Note that the arrester conducted the surge current only, hence the conspicuous absence of expulsion gases. The test shows typical Autogap duty cycle operation.

Proven: Autogap superiority has been demonstrated in impartial field tests conducted by utility companies; in exhaustive laboratory tests; in over 14 years success-performance record from coast to coast.

- Highest lightning capacity for intense or long duration surges.
- Lowest discharge voltage. *Exclusive twin vent.*
- The only arrester, valve or expulsion, that prevents power follow current.

HUBBARD AND COMPANY

ESTABLISHED 1843

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the Load on Hubbard Hardware!"

Test Potential Transformers

with *Speed, Safety & Accuracy*

KNOPP

Potential Transformer Testing Equipment Type PB-14000

Precision testing of instrument potential transformers with accuracy, speed, and safety is assured with this Knopp equipment.

It has a Knopp Unload Set featuring a Knopp Precision Multirange Potential Transformer Standard that provides, with a 15-volt-ampere burden to give an example, a ratio accuracy within .02% and a phase-angle accuracy within 5 minutes. Same precision on all ranges.

The Knopp Potential Transformer Testing Equipment is carefully built by a company with an engineering background in the electrical utility field of 51 years, including the last 36 years as successful manufacturers of precision testing equipment.

The entire unit is compact, precision built, and proved in electric power company laboratories. Its special refinements for accuracy, speed, and safety of testing, plus its reliability, come from long manufacturing experience. Write for full details.

Knopp Precision Multirange Current Transformer, Type P-5000. Designed for high- and low-voltage work. Because of 30 current ranges from 5 amps to 5000, this transformer is ideal for testing current transformers. Ratio is within .02% and phase angle within one minute.

The Knopp Phase Sequence Indicator — for 3-phase, 3 wire and 2-phase 3 wire; 60 volts to 600 volts. Rotating Indicator shows sequence A-B-C or C-B-A. Light weight, compact. Big time saver.

***Also:* Knopp Meter Testing Equipment, and Current Transformer Testing Equipment.**

For complete technical descriptions please write us today.

KNOPP

Electrical Facilities Inc.

4236 Holden St. Oakland 8, Calif.

shapes and in rectangular and tubular conductors. Tolerances for 55EC conform to the present standards for rectangular and tubular bus conductors.

Development work is being continued on the new alloy with a view to further increasing its conductivity while maintaining high tensile and yield strength properties. Properties of 55EC as compared with other alloys are:

Alloy:	55EC	EC-H17	6063-T6
Tensile strength, minimum, psi...	29,000	17,000	32,000
Yield strength, minimum, psi..	25,000	15,000	25,000
Conductivity, minimum, %IACS..	55	61	51

Kaiser Aluminum & Chemical Sales, Inc, 1924 Broadway, Oakland, Calif.

Multistage Blower

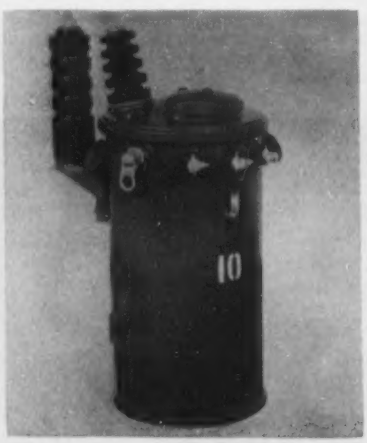
Multistage, centrifugal blower is capable of delivering air between 1,500 and 5,000 cfm, with pressures from 1 to 9 psig, or vacuum from 2 to 12 in. Hg. The 385-frame unit uses a combination of two interchangeable impellers. The units are self-adapting to any variation in air volume requirements from minimum to maximum capacity. Units can also be equipped with impellers that import a non-overloading characteristic. **U. S. Hoffman Machinery Corp, 105 Fourth Ave, New York, N. Y.**

Connector Press

Hook-head manually-operated hydraulic Hypress, Type Y35, weighs about 12 lb and delivers 12 tons of compression force. It installs an extended range of Hysplice and Crimpit overhead compression splices and taps, Hylug terminals, and Hylink splices, on all conductor types.

The Y35 installs Hysplices and other overhead transmission and distribution compression connectors on the following range of conductor sizes:

(*Continued on page* 196)



Line of Distribution Transformers

Redesigned line of distribution transformers is claimed to have improved electrical characteristics, improved sealing, fewer parts, and, in the larger ratings, are smaller. These transformers will be built in single-phase ratings from 3 to 167 kva, 15,000 v and below. Three-phase ratings will range from 9 to 150 kva, 15,000 v and below.

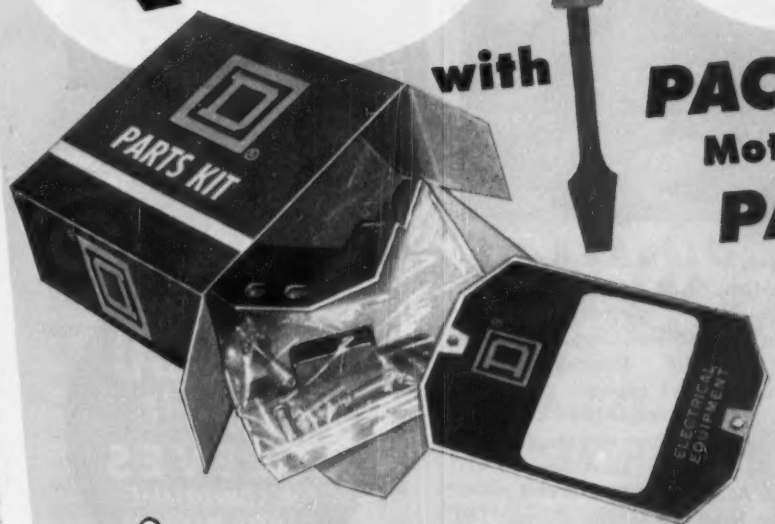
The larger ratings have been designed to have the shortest possible wall heights and still meet EEI-NEMA requirements. Height reductions range from 22.7% for 25-kva ratings to 13% for 37.5 and 50-kva ratings.

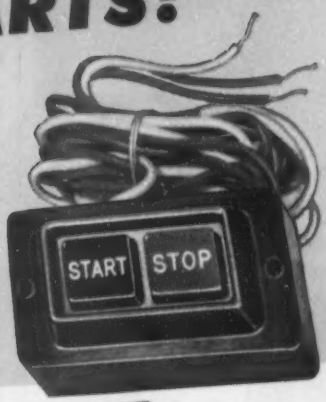
The tank cover is secured through a clamping arrangement, consisting of a single bolt threaded into an internal beam support. The single bolt applies uniform pressure throughout the entire circumference of the corprene gasket.

Step-type core design gives a shorter mean turn in the coil. Other improvements include new high- and low-voltage bushings, new lightning arrester, and arrester-mounting brackers. **Westinghouse Electric Corp, P. O. Box 2099, Pittsburgh 30, Pa.**

Qwik Change

with **PACKAGED** Motor Starter **PARTS!**





New PUSH BUTTON KIT

OTHER KITS...

- Selector Switches
- Interlocks
- Replacement Parts
- Contacts
- Coils
- Overload Relays

EASY to Identify!

Easy-to-read catalogs, simplified motor control and overload relay selectors, illustrated service bulletins...these all combine to assure *quick changes* through easy parts identification.

EASY to Buy!

Conveniently packaged and labeled conversion parts are immediately available "off-the-shelf" from nationwide network of authorized SquareD electrical distributors.

FASTER to Install!

Conveniently packaged parts can be installed using only a screw driver and without disturbing any wiring.

Write for Bulletin 9999. Address Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

172 ELECTRIC UTILITIES USE CHARCO'S FLEX-SAF LINEMEN'S GLOVES

Why?

Because they find them:

1 Safer . . . they are the result of extensive laboratory research, continuous control for uniformly high quality, careful processing, rigid inspection and testing exceeding ASTM requirements.

2 More comfortable . . . proven hand design, with curved fingers, greater flexibility, reducing hand fatigue.

3 Longer life . . . superior formulation, proven by field experience.

Your linemen, too, deserve the safest. Give them CHARCO FLEX-SAF RUBBER GLOVES.

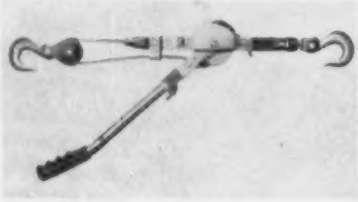
Write today for complete catalog of safety products

CHARLESTON RUBBER COMPANY
Stark Industrial Park
Charleston, South Carolina

Other products manufactured exclusively by CHARCO include:
CHARCO FLEX-FIT PROTECTIVE SLEEVES
CHARCO BULLDOG COMBINATION CLAMPS

Copper, 8—400 Mcm; aluminum, 6—477 Mcm; ACSR 6—477 Mcm; steel, 5/16—½ in.; Copperweld, 8 solid—½ in.; Copperweld-Copper, 8A—2A and 2F—2/0F. Crimpit Program service tap and entrance connectors and splices accommodated cover the following conductor size ranges: Copper, 8—400 Mcm; aluminum, 6—477 Mcm; ACSR, 6—477 Mcm.

The head is rotatable through 180 deg. Body and handles are covered with molded neoprene insulation.
Burndy Engineering Co, Inc, Norwalk, Conn.



Hoists

Five models of power-pull hoists range from ¾ to 1½-ton capacity. Minimum and maximum lifting ranges are from 72 to 180 in. in the lightweight (6 lb) ¾-ton line, and 72 in. in the (7½ lb) 1½-ton line. Standard accessories are available. All models come with two slip hooks as standard equipment. Power ratio of the ¾ ton units is 14 to 1; for the 1½-ton units, 28 to 1. Units are tested at 50% overload. The ¾-ton models are rated 2,800 lb; the 1½-ton, 8,400 lb.
American Gage & Mfg Co, Dayton 1, Ohio.

LINEMEN PREFER...

CHARCO FLEX-FIT SLEEVES FOR COMFORTABLE, FLEXIBLE MAXIMUM PROTECTION

Field experience proves that linemen *more readily* accept Charco's Flex-Fit Rubber Sleeves.

WHY? Because they find them:

1 More comfortable . . . light-weight, dipped, seamless design gives flexibility, reduces arm fatigue . . . shaped shoulder stays in place for maximum protection.

2 Safer . . . same rubber formulation proven durable in Charco Flex-saf linemen's gloves . . . rigidly inspected and tested . . . exceeding ASTM requirements.

Made in 2 weights, 2 sizes, 2 styles . . . also custom made to special designs.

Your Linemen will wear Flex-Fit Sleeves. Write today for complete catalog of safety products and name of your nearest distributor.

CHARLESTON RUBBER COMPANY
Stark Industrial Park
Charleston, South Carolina

Other products manufactured exclusively by CHARCO include:
CHARCO FLEX-SAF RUBBER GLOVES
CHARCO BULLDOG COMBINATION CLAMPS

New Motors

Several new a-c motors available are—totally enclosed, fan cooled split phase, shaft-mounted, and end-mounting types; Tri-Clad "55" explosion-proof and single-phase types; for d-c operation—an armored mill motor.

General Electric Co, River Rd, Schenectady 5, N. Y.

Split-phase, tefc, fhp . . . Totally enclosed, fan-cooled, split-phase fractional hp motors are claimed to be smaller and ⅓ lighter than previous designs. Motors are intended for driving light machine tools and materials handling systems, and for continuous operation under conditions of dust and dirt. Large-size ball bearings absorb thrust loads and are said to require no lubrication for ten years' normal service. Motors have built-in terminal board and base slots. Mounting dimensions are the same as for standard open motors of the same rating. In NEMA 48 and 56 frames, the motors are available in ratings of 1/6 hp, 1140 rpm, to ⅓ hp, 3450 rpm, 60 cps. Models for 50 cps are also available.

Shaft-mounted, tefc, fhp . . . Totally enclosed, fan-cooled, fractional hp motors are designed for shaft-mounted fans and blowers. They are said to weigh 50% less than previous models with equivalent ratings. Extended through-bolts provide a solid mounting face beyond the surface of the end shield. Resilient rings on bearing housings, and optional resilient base, make possible wide variety of mounting arrangements. Motors are designed for continuous service under conditions of dust and dirt. They are available in one- and two-speed, single-phase models, and in single-speed, polyphase models, ratings up to ½ hp, for moderate thrust applications. Ball bearings are available for heavy-thrust applications.

End-mounting, fhp motors . . . End-mounted fractional hp motors have special grease for increased bearing life. Slot and between-phase insulation is Mylar polyester film. Formex wire and Glyptal varnish are used to resist heat, aging, and moisture. Cast-aluminum fan provides ventilation.

Motors are available in open, and totally-enclosed, fan-cooled models, NEMA size 56C face mounting. Ca-

...thanks to HUBBELL Twist-Lock® TRADE-MARK 4-WIRE ELECTRICAL CONNECTORS

Wherever portable electrical apparatus is used, Hubbell Twist-Lock is recommended for 2, 3 or 4-wire systems.

Twist-Lock 3 and 4-wire sizes are available grounded and not grounded.

7413 Connector body

7408 Flush Motor base

4893 Seal-tite rubber cover and chain used to close face of 7408 when not in use. (Unit not shown)

Hubbell sales engineers will gladly consult with you on special problems. Write Dept. E-2 today for help or information.

Mobile cafeteria trains, an entirely new idea in feeding large numbers of employees, are now employed at the new Torrence location of the El Segundo Division of Douglas Aircraft Company, Inc., California. The food is transported to all parts of the 214-acre plant, piping hot and ready to serve, by means of 12 three-car trains.

Hubbell Twist-Locks play an important part in this operation. When the battery-powered train pulls up to its station, the operator Twist-Locks the unit to a plant outlet to supply power for refrigerators, ovens, etc. In addition, each car is inter-connected with 4-wire Twist-Locks.

Here is another practical modern application showing the versatility and dependability of Twist-Lock, first and still the finest self-locking connector made.

Highest Grade HEAVY DUTY WIRING HUBBELL DEVICES

HARVEY HUBBELL, INC.
BRIDGEPORT, CONNECTICUT

21HH54

STRANDVISE®

THE SELF-ACTING SELF-CONTAINED TOOL FOR TERMINATING STRAND

Wherever strand is to be terminated, STRANDVISE provides a means that is unmatched for speed and versatility. Many Utilities now know what STRANDVISE does for their pocketbooks.

STRANDVISE makes it possible to install guy wires without waste of time or strand, to terminate suspension strand or ground wire quickly and easily. STRANDVISE, equipped with a new 18" flexible bail, simplifies "false dead-ending" (slack span construction).

STRANDVISE grips surely yet permits easy accomplishment of desired tension or later adjustment to take up slack in strand.

Write for sample STRANDVISE so you may see for yourself its many advantages.

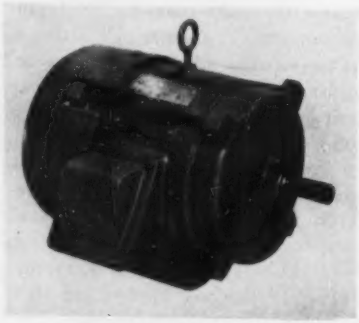
Reliable ELECTRIC COMPANY 3145 Carroll Avenue Chicago 12, Illinois

Over 45 years of service to the utilities

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

pacitor-start and polyphase open models are designed for operation of close-coupled centrifugal pumps, mounting vertically or horizontally, continuous or intermittent operation. Totally enclosed, fan-cooled model is designed for application in dirty or unfavorable locations. Both models are in ratings of ¼, 1725 rpm, to 1 hp, 3450 rpm.

1 to 5 hp, explosion-proof . . . Tri-Clad "55" motors feature extra protection for hazardous-location applications. An addition to the NEMA rerated line, the motors have heavier frame and end shield castings, a machined-fit conduit box, a Textolite



plastic cooling fan, and a lifting ring. The Tri-Clad "55" explosion-proof motors are rated 1 to 5 hp, and are designed for use under Class I, Group D; and Class II, Groups E, F, and G applications. In addition to previous atmosphere classifications, the motors are approved for use in atmospheres containing metal dusts, magnesium, and aluminum.

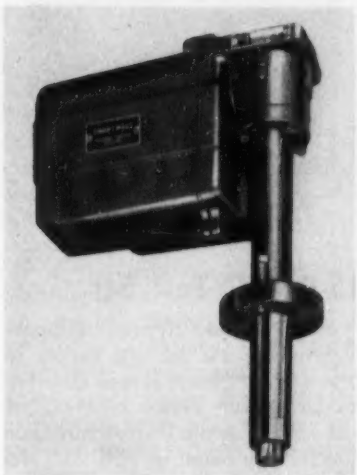
1 to 5 hp, single-phase . . . Tri-Clad "55" single-phase capacitor motors feature higher full-load speeds, higher overload capacity, and higher breakdown torque. Built to rerated NEMA standards, they feature size reduction, rigid cast-iron construction, and incorporate new insulation, bearing assembly, and ventilation. A centrifugal mechanism throws out when the motor is up to speed and disconnects the starting capacitors.

Leads on fibre terminal board behind a cover plate may be connected for either 115 v or 230 v, 60 cps operation. By interchanging two leads, rotation can be reversed. Motors are available in the standard, foot-mounting, and in vertical, D-flange and C-face, close-coupled pump, or resilient-base mounting. They are available

in dripproof or totally-enclosed, fan-cooled enclosures. Ratings are 1 to 5 hp.

500-hp, armored mill motor . . . "Giant" armored d-c mill motor is designed for heavy-duty work in mining and steel-mill applications. It is too large to be covered by present standards of the Association of Iron and Steel Engineers, but adheres to requirements set for smaller motors of this type.

It is said to have increased commutating capacity and higher continuous-rated torque. The "Giant" incorporates a universal enclosure, making possible five systems of ventilation and protection by substituting different types of covers on the frame openings. The motor is rated 500 hp at 350 rpm.



Pressure Transmitter

Pressure transmitter using no stagnant pressure lines permits pressure measurements at high operating temperatures. The P3T flush diaphragm pressure transmitter has all parts in contact with fluids made of stainless steel. The measuring diaphragm mounts inside a well mounted on the pipe line—the diaphragm surface is flush with inside of pipe wall.

Small movements of diaphragm, in response to pressure changes, are transmitted through a rod to a mechanical linkage. The linkage actuates a core of a differential transformer, the output signal of which varies from 0.000 to 0.500 v, 60 cps, and is directly proportional to pressure being measured. No air lines, slide wires,

STRANDLINK®

THE SELF-ACTING
SELF-CONTAINED TOOL
FOR SPLICING STRAND

Wherever strand is used, whether for ground wire, suspension strand, down guys or anything else, STRANDLINK is the most economical means for splicing.

STRANDLINK makes the splicing of any grade or size strand simple and easy yet safe and sure. The exclusive Reliable Pilot Cup caps and guides the strand to its proper position. Nuts, bolts, hardware and johnny balls are eliminated. STRANDLINK costs much less than alternate pieces of hardware before installing time is even taken into account.

Hundreds of case-hardened, plated steel teeth in each gripping chuck HOLD firmly and permanently. Assembly is factory treated with corrosion inhibitor lubricant.

Ask on your company letterhead for a sample STRANDLINK; it will be sent promptly without charge.

JAWS OF GRIPPING CHUCK SURROUND STRAND TO HOLD PERMANENTLY
PILOT CUP IN NOSE GUIDES STRAND THROUGH
MADE FOR ¼" TO ⅝" STRAND

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Chicago 12, Illinois

POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

3 SPECIAL Royal DEVICES FOR ELECTRICAL ENGINEERS

TYPE MA ELECTRIC COUNTER

for a record of equipment operation

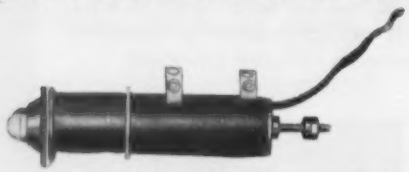
This compact electric counter was developed particularly for recording operations of circuit breakers or motorized and automatic group operated switches. The Type MA Counter may also be used for counting the operations of many electrical devices or other equipment on which a record of operations is desirable. The MA Counter is available for surface or flush mounting and can be supplied with a hand-reset feature.

PORTABLE

SILVER PLATING EQUIPMENT

for use in shop or field

Silver plating electrical contacts produces an effective low resistance contact. The Rapid Portable Silver Plater offers the best method yet developed for silver plating contact surfaces. Heating of bolted connections and switch contacts can be reduced or eliminated where *high* pressure wiping action is not obtained. The plating anodes allow difficult locations to be plated with a minimum of effort. Silver plating can be done in the shop or in the field.



ROYAL Indicating Lamps

Type ZX available with glass color lamps

ROYAL Type ZX Indicating Lamps have a wide application on switchboards, control panels, boiler feed pump panels, regulator panels, circuit breaker indicators, switch position indicators, and other equipment where lamp indication is necessary. The color caps have a screw base and are easily removed. The material is GLASS which is positive in color and permanent. Available in white and four colors—red, green, amber, and blue.

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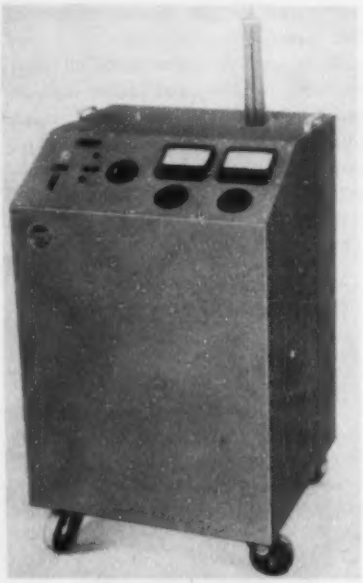
motors, or vacuum tubes are used.

The P3T is usable in ranges of 0-200, 1,000, and 2,500 psig for operation up to 300 C. Sensitivity is 0.005%, reproducibility 0.1%, and accuracy 1%.

Swartwout Co, 18511 Euclid Ave, Cleveland 12, Ohio



15-Kv DC Test Set

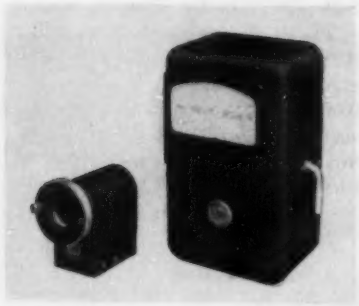
Model 437 dc Hypot is a mobile high-voltage test set with output of 0 to 45 kv. Voltage is read on a 4½ in. meter with ranges of 0-15, 30, and 45 kv. Output current is read on a meter with ranges of 0-50, 250, and 2,500 microamperes. A voltage-doubler circuit is used with metallic rectifiers. The diodes, capacitors, meter multipliers, and transformer are oil-immersed.

Associated Research, Inc, 3758 W. Belmont Ave, Chicago 18, Ill.

P-E Pyrometer

Photoelectric pyrometer for industrial use is for precise monitoring and control of the temperature of hot materials. Control operates from the amount of infra-red radiation emitted by the hot object. Through a fast-acting relay, the heat applied to the material can be controlled throughout the range of the set.

The system consists of a Type 41AU4 scanner (photoelectric tube



and lens assembly with variable iris) and Type 27LJ7 control (electronic amplifier, relay, and meter). Range is 1,000 to 5,000 F; sensitivity is 1 ft-c fullscale; power input is 115 or 230 v, 50/60 cps, 12 w.

Photoswitch Div, Electronics Corporation of America, 77 Broadway, Cambridge 42, Mass.

Protective Spray

Easy-to-use aerosol spray compound called Peneseal is designed to protect aluminum-to-aluminum and aluminum-to-copper service connections. Non-toxic, non-inflammable, non-irritating compound seals the connections, and is claimed to maintain low contact resistance by counteracting the effects of oxide film, and prevent galvanic corrosion. Peneseal is applied as a foamy aerosol spray, eliminating brush application. The foam quickly changes to a tacky, self-healing transparent film, affording protection without affecting the conductor insulation.

Peneseal is available in 12-oz cans, and may be applied at temperatures from 20 to 120 F.

Burndy Engineering Co, Inc, Norwalk, Conn.

Valve Drives

Electro-automatic and manually operated drives for rotary-type valves have mounting flanges separate from main housing, providing flexibility in mounting. The line consists of over 13 models. Operating speeds conform to 15 and 7½ sec rotary valve operation. A cutout automatically disengages the motor if the valve closes against an obstruction.

Janette Electric Manufacturing Co, Mortan Grove, Ill.

ACCO Registered* Slings

ACCO Quality
With these parts you can assemble ACCO Registered Wire Rope Slings for 85% of your lifting requirements
1 Oval links
2 Upper safety shackles
3 Lower safety shackles
4 Hooks
5 Strand-Laid and Cable-Laid sling legs
Stocked by your Distributor

Don't Gamble with Safety!

• In addition to the six quality features of all ACCO *Registered* Slings, ACCO offers you the convenience of distributor stocks of popular types, diameters, and lengths of slings—and a variety of tested fittings—which handle most of your sling requirements.

Safety of men and machines in your shop is your primary concern. It's ours, too. During the years that ACCO *Registered* Slings have been available, they have been put to every conceivable laboratory and field test. They have proved themselves. They are no experiment. Don't YOU gamble with safety. Specify ACCO *Registered* Wire Rope Slings for all your lifting jobs.

Check today with your ACCO *Registered* distributor, or write to our Wilkes-Barre, Pa., office for our S-2 Sling folder. Remember—if it's ACCO *Registered*, it's SAFE.

- The best material
- Unit safety factor (on bodies, links, safety shackles, hooks)
- Proof test of complete sling to twice rated capacity
- Actual field service test of each model
- Metal identification tag on each sling
- Signed Registry Certificate with each sling

*Trade Mark Registered

ACCO

TRADE MARK

Wire Rope Sling Department
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn. • In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

for Better Value

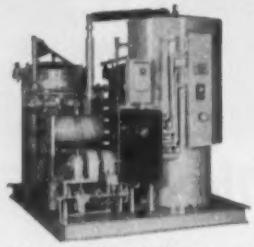
TRANSFORMER OIL PURIFICATION *with the* HILCO HYFLOW OIL RECLAIMER

reduces costs of

1 TRANSFORMER MAINTENANCE

2 OIL REPLACEMENT

With this 300 g.p.h. mobile Hilco Reclaimer the City of Tacoma, Washington, purified 100,000 gallons in three months at a saving of $30,000.



Cincinnati Gas & Electric Company reports an annual saving of $4,000 with this stationary Hilco Reclaimer.

The HILCO HYFLOW Oil Reclaimer combines a duplex fullers earth filter with a vacuum vaporization system to remove water, sludge, soluble oil oxidation products, paint, bushing compound, metallic soaps, etc. Oil is restored to new oil values as indicated by Neutralization Number, Interfacial Tension, and other tests.

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MORE NEW PRODUCTS
about which you should know

Thermo Instruments Co, 1310 Old County Road, Belmont, Calif, has **differential-level monitor,** Model DL, utilizing bubble-tube principles of differential pressure, control manometer, and electronic relay.

Far-Ex Corp, 75 West St, New York 6, N. Y. has fire **safety suits** which withstand 2,500 F, weigh 10 lb; utilize aluminized fabric.

Harrington & King Perforating Co, 5655 Fillmore St, Chicago 44, Ill, suggest build-your-own **safety guards** for gears, belts, etc using their standardized parts (ask for bulletin).

Coming New Equipment

Received Too Late For This Issue

ID Phantom Load

States Co—Checks watt-hour meters to 50 amp, 50% or 100% pf, on single-phase source

Hand Compressor Tool

Alcoa—Installs accessories on ACSR and aluminum to 350 Mcm, develops 12-ton thrust

380-Kv, 1,600 Amp Switch

Delta-Star—Outdoor, disconnect, has 1,470-kv BIL impulse level

Townsend Co, New Brighton, Pa, has Tuff-Tite **multi-purpose fastener** with one-piece metal washer-head and assembled neoprene washer for watertight, air-tight construction.

North American Philips Co, Inc, 750 S. Fulton Ave, Mt. Vernon, N. Y., has 5-kv contact **microradiograph** (Type CMR5), using miniature X-ray tube with beryllium window . . . Norelco also has Autrometer for checking chemical constituents in specimens by comparison with standards.

Tork Clock Co, Inc, Mount Vernon, N. Y. has **7-day clock switch** for programming of operations.

Rockwell Manufacturing Co, 400 N. Lexington Ave, Pittsburgh 8, Pa. has **multi-range integrator** that mechanically computes the metered volume of gas, steam, or liquids from orifice meter charts.

National Electric Products Corp, Gateway Center, Pittsburgh, Pa. has Superduct heavy-duty **rigid steel conduit,** coated with vinyl chloride copolymer to resist corrosive atmospheres.

CATALOGS • BULLETINS

● **MOTORS:** Price list for motor controls and squirrel-cage induction motors, frames B56 to 686S, 1/6 to 400 hp, is dated Sept. 1, 1954 (Form 943). Century Electric Co, 1806 Pine St, St. Louis 3, Mo.

● **ADJUSTABLE-SPEED DRIVE:** Tools of Automation, 12 pages, covers features of variable-speed motor drives. Reliance Electric & Engineering Co, 1076 Ivanhoe Rd, Cleveland 10, Ohio

● **LARGE, 2-POLE MOTORS:** Bulletin 05R8123, 8 pages, covers design features of 2-pole motors, 900 hp and larger. Allis-Chalmers Manufacturing Co, 932 S. 70th St, Milwaukee, Wis.

● **BLOWERS:** Bulletin CTB-103, 12 pages, covers Turbo-Pressure Blowers, with charts and specifications on this type of fan. Bulletin MD-101, 28 pages, gives specifications, performance charts, and dimensions on line of MD fans. Chicago Blower Corp, 9867 Pacific Ave, Franklin Park, Ill.

● **MOTOR CONTROLS:** Electric motor controls—push buttons; drum controllers; foot, master, limit, tap, pressure, float switches; overload relays; parts kits; etc are covered, indexed, and priced in 140-page catalog, No. 101, July, 1954. Furnas Electric Co, Batavia, Ill.

● **SHADED-POLE MOTORS:** GEA-6134 (10 pages) covers shaded-pole motors from 1.5 w to 1/6 hp. General Electric Co, 1 River Rd, Schenectady 5, N. Y.

● **GEARS:** Bulletin DRB (8 pages) gives claimed advantages of gears made by Foote Bros. Gear & Machine Corp, 4545 S. Western Blvd, Chicago 9, Ill.

● **V-BELT DRIVE:** Folder 6638 shows Poly-V drive, a multiple V-belt drive for power transmission. Manhattan Rubber Div, Raybestos-Manhattan, Inc, Passaic, N. J.

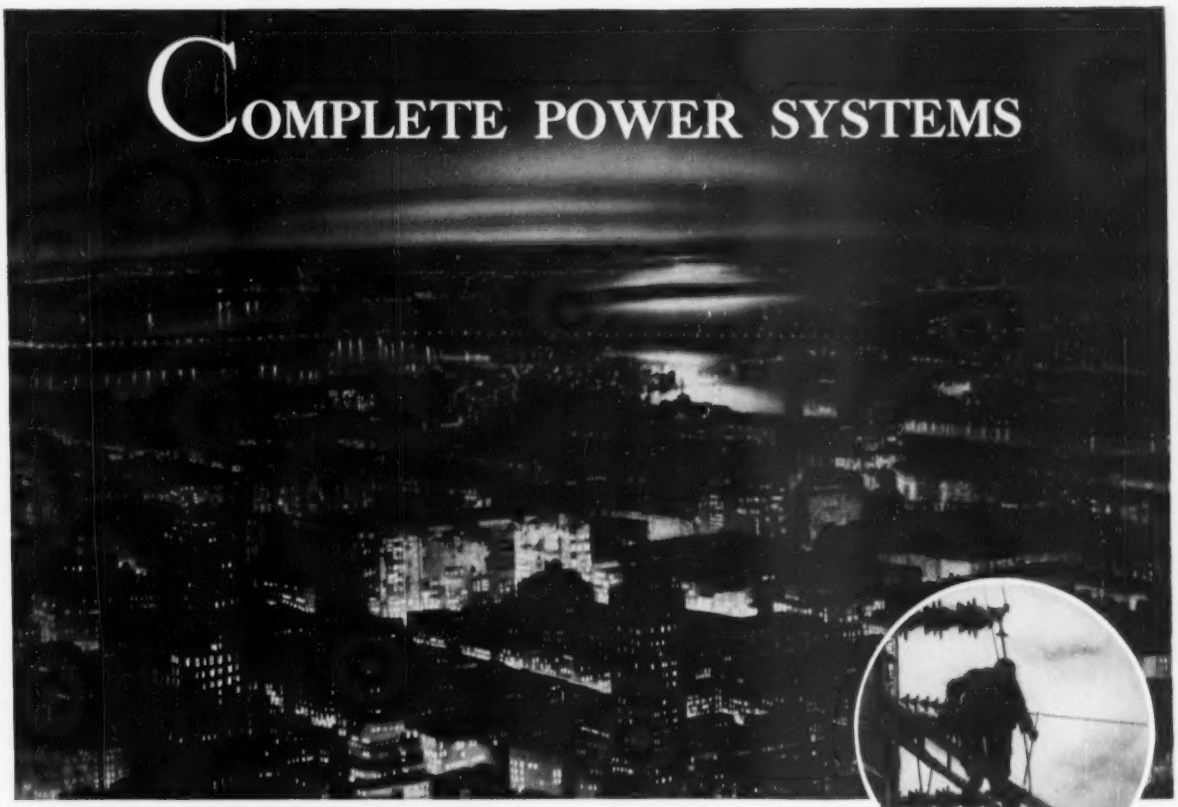
● **SPEED REDUCERS:** C-line of worm gear speed reducers claimed to have greater capacity in less space are shown in Bulletin HW654, 8 pages. Winsmith, Inc, Springville, N. Y.

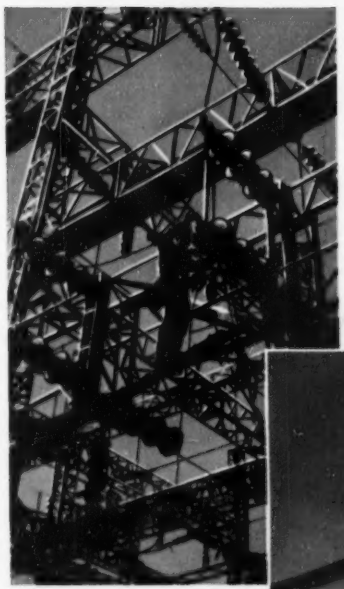
● **SHAFT-MOUNTED DRIVES:** Bulletin 7101 (8 pages) covers all-steel shaft-mounted drives, including selection tables, sheave ratios, dimensions, and bushings. Falk Corp, 3001 W. Canal St, Milwaukee 8, Wis.

● **CENTRIFUGAL BLOWERS:** Bulletin M-103, 12 pages, covers multistage centrifugal blowers and exhausters, 1 to 9 psi, 2 to 12 in. Hg vacuum. U.S. Hoffman Machinery Corp, 105 Fourth Ave, New York 3, N. Y.

● **HARNESS CLAMPS:** Engineering Manual 201G, 68 pages, covers 40,000 types and sizes of bare metal and cushioned or insulated line support clamps, wire harness clamps, and multiple support clamps. Also covers brackets, busbars, and laminated anchor nut or reinforcing shims. Thomas Associates, 4607 Alger St, Los Angeles, Calif.

COMPLETE POWER SYSTEMS





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The Corporation's service includes the initial planning of the system; forecast of loads; design and construction of generating units; transformer facilities; switching distribution; location and construction of transmission lines and substations; interconnection; and the determination of equitable rates.

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Write or call us for information as to how our experience may be of assistance to you.

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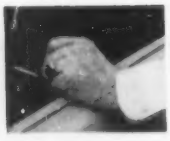
Picture of a confident system supervisor...



. . . confident because, with a touch of his hand, he selects an electronically-calculated answer to any load-frequency operating problem which his system is apt to encounter. For his L&N Load-Frequency Control Console embodies the accumulated judgment of system operating engineers throughout the country. These engineers are the men in more than 300 control installations who have worked with—and contributed to—L&N Load-Frequency Control in the past quarter century.

Thus, when you apply L&N Load-Frequency Control to your system, you're assured of a control that meets all known requirements including: characteristics of the various generating units, overall area requirements, interchange contracts, and parallel operation with load-frequency control equipment in neighboring systems. And you have flexibility—your control console can be readily "tuned" to changing conditions such as a frequently revised incremental loading schedule.

Also, L&N Load-Frequency Control gives you and your power neighbors stronger ties—better working cooperation, and an actual increase in the effective use of tie lines. Thus, you get the full benefit of interconnected-system operation.

You'll appreciate the extent of utility-L&N teamwork when you discuss your needs with our Field Engineers. Contact 4938 Stenton Avenue, Philadelphia 44, Pa.

TECHNICAL LITERATURE

PIPE-TYPE CABLE PROTECTION—Publication 54-3, "Pipe-Type Cable Corrosion Protection Practices in the Utilities Industry, 16 pages, is the first interim report of the committee on corrosion of cable sheaths. The report covers 17 operators with about 90% of U. S. mileage of pipe-type cable. Price, 50¢. National Association of Corrosion Engineers, 1061 M&M Bldg, Houston 2, Texas.

BRAZING—Brazing manual, a 22-page booklet (Form 754), is written to show some simple ways to do brazing, soldering, and welding. Items covered include copper and its alloys, aluminum and aluminum castings, cast iron, steel, and stainless steel. All-State Welding Alloys Co, Inc, 249-55 Ferris Ave, White Plains, N. Y.

WELDING—WELDesign No. 9, 4 pages, gives hints on how to save on fabricating cost. Lincoln Electric Co, Cleveland 17, Ohio.

WELDING COPPER—A 4-page news sheet covers 5 new copper welding alloys. An 8-page booklet is entitled "How to Overcome Your Welding Problems and Improve Your Welding Techniques." Eutectic Welding Alloys Corp, 40-40 172 St, Flushing, New York, N. Y.

COMBUSTION—Diffusion Flames in The Laboratory, a 12-page AGARD report (No. AG11/M7), is a reprint of a paper by John Barr, U. of Glasgow. Of interest to those in combustion research, the report includes 55 references. Advisory Group for Aeronautical Research and Development, c/o National Advisory Committee for Aeronautics, 1512 H St NW, Washington 25, D. C.

CONSTANT-VOLTAGE TRANSFORMER—The Sola Constant Voltage Transformer, Theory of Design and Operation (CV-210, 16 pages) covers static magnetic ac voltage regulators employing a resonant circuit. Sola Electric Co, 4633 W. 16th St, Chicago 50, Ill.

EDDY-CURRENT EQUIPMENT—Bulletin GB2 (16 pages) covers principles and uses of eddy-current adjustable-speed rotating equipment: couplings, brakes, dynamometers, etc. Dynamatic Div, Eaton Manufacturing Co, Kenosha, Wis.

ROCKING-CONTACT REGULATOR—Rocking-contact voltage regulators for generators are described in 12-page booklets. P 08-3090 contains technical descriptions of Type JS1/1 and JSG1/1 for small and medium ac generators from 20 to 438 kva, exciter voltage of 80 to 125 v. P 08-3095 covers Type JB1/1 for medium and medium-large ac generators, 438 to 1,175 kva. Brown Boveri Corp, 19 Rector St, New York 6, N. Y.

PLANT MAINTENANCE—Good Operating Practices (12 pages) contains 101 suggestions for maintenance of plant buildings and equipment to get best service out of insulations, packings, refractory products, roofings, and friction materials. Johns-Manville, 22 E. 40th St, New York 16, N. Y.

WELDING CROLOY—Data Card 162 (4 pages) covers recommended welding procedures for stainless Croloy tubing and pipe. Babcock & Wilcox Co, 712 Eleventh St, Beaver Falls, Pa.

ADEQUATE WIRING—Electrical Operation Headaches, How to Cure Them and Profit (16 pages) shown in cartoon form the symptoms and remedies for electrical failures in office and industry. B. Eichwald & Co, Inc, 237 E. 39th St, New York, N. Y.

HOME REMOTE-CONTROL WIRING—Publication 16-284, Remote-Control Wiring System, Manual for Residential Wiring Design and Installation (32 pages) covers a 24-v ac relay and switching system. General Electric Co, Wiring Device Dept, Providence 7, R. I.

DIETARY SERVICES—Hospital Dietary Services, by C. W. Schroeder (72 pages) covers the food-service of small to medium size hospitals (16 to 200 beds). Sections cover space requirements and location, planning, final layout and architecture, selection of equipment, and advantages of electric equipment. Hotpoint, 227 Seeley Ave, Chicago 12, Ill.

BOOKS

Received Since November 1

Collective Bargaining: Negotiations and Agreements. By Selwyn H. Torff. Published by McGraw-Hill Book Co, New York 36, N. Y. 323 pages. Price $5.50.

Electric Power Stations. 4th Edition. By T. H. Carr. Published by Chapman & Hall Ltd, London, England. 605 pages, illustrated. Price 70s. net.

Electroacoustics. By Frederick V. Hunt. Published by John Wiley & Sons, New York 16, N. Y. 260 pages. Price $6.00.

Experimental Electricity for the Beginner. By Leonard R. Crow. Published by The Scientific Book Publishing Co, Vincennes, Indiana, 284 pages, illustrated.

General Electricity. By E. W. Jones. Published by McKnight & McKnight Publishing Co, Bloomington, Ill. 120 pages, illustrated. Price $1.25.

Lighting for Color and Form. By Rollo Gillespie Williams. Published by Pitman Publishing Corp, New York 36, N. Y. 340 pages, illustrated. Price $8.50.

The Microphysical World. By William Wilson. Published by Philosophical Library, Inc. New York, N. Y. 216 pages, illustrated. Price $3.75.

Opportunities of Electrical Engineering. By S. Paul Shackleton. Published by Vocation Guidance Manuals, Inc. New York 36, N. Y. 128 pages. Price $1.00.

Principles of Transistor Circuits. By Richard F. Shea. Published by John Wiley & Sons, Inc. New York 16, N. Y. 535 pages, illustrated. Price $11.00.

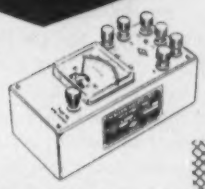
High-Frequency Heating

Induction and Dielectric Heating. By J. Wesley Cable. Published by Reinhold Publishing Corp, New York 36, N. Y. 576 pages, illustrated. Price $12.50.

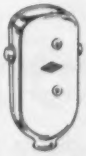
This book includes the latest applications of high-frequency heating in industry, also sufficient theory for a full understanding of the basic phenomena applicable to both induction and dielectric heating. Coil and electrode designs are covered, also the construction of mechanical jigs and fixtures and work handling methods. The practical information on cost saving processing methods is useful to metallurgists and production, research and design engineers. Industrial executives will find the book useful in solving processing problems involving high frequency heat.

Investigate these **METER TESTING ACCESSORIES** Now in use by Leading Utility Companies

FIELD TEST SET



This instrument is a simple, inexpensive, portable means whereby the customer's current transformer installation may be quickly checked for basic sources of trouble.

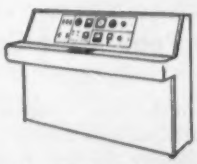


POTENTIAL SWITCH for METER TESTING

This is a special form of the well-known snap action Micro Switch; needs only 6 ounces of pressure to operate it; long lived — modified to suit the requirements of manual control of rotating standard potential.

INSULATION TESTER

Developed in response to the need for an insulation testing device that would have: maximum safety, instantaneous indication, direct reading in megohms without calculations, ability to discriminate between a complete insulation breakdown and leakage through insulation, portability and compactness.



METER TESTING POWER SUPPLY

The purpose of this apparatus is to furnish a stable and controlled source of single phase potential and single phase current for general testing purposes, together with means for adjusting the phase angle so that power may be supplied at any desired power factor, leading or lagging.

Write for Complete Information

EASTERN SPECIALTY CO.
PHILADELPHIA 40, PA.

READERS FORUM

Controls Build Load for Gas Companies

To the Editor:

Your Nov. 1 issue is packed with interesting items, and I have enjoyed it very much.

However, it grieves me to have you suggest, editorially, that the electric industry should consider control for house heating loads. Frankly, I think that you wasted a page (61). How the industry that can do so much "capacity-wise" and be so timed "loadwise" amazes me!

Water heater controls have been one of the gas industry's best load builders. This week, here at Cambridge Springs, Pa., we are celebrating the coming of natural gas service. Gas will largely take over water heating and house heating. Surely coal converted to electricity would be more desirable, but the public could not, or would not, wait—especially since they have never heard of electric heat.

Demand rates are killing electric load every day. Why not an editorial on a modern look at demand charges, in the light of present system capacities?

We are now "serving heavy rural loads with a low cost system." We serve 5,453 farms using from zero to 3,400 kwhr per month, all single phase and all adequately served. Our investment is $353 per consumer. Our farms have had service an average of about 10 years and now average 400 kwhr per month.

We think that we have modern water heating and commercial rates. At least they are helping us to prosper, with a 17% annual load increase. Our load factor steadily improves with these rates.

We have no demand charges on any farm of any size, nor will we penalize house heating. Nor will we call a farm "all-electric" until the farm home can afford the "necessity" of electric heat as well as the "luxury" of air conditioning.

We firmly believe that "all-electric" farming as well as house heating can be best promoted by encouraging not penalizing and blocking.

William C. Wenner
Manager
Northwestern Rural Electric Co-operative
Cambridge Springs, Pa.

It's Load at Peak That Counts

To the Editor:

Your editorial in the Nov. 1 issue apparently is intended to show that conditions have changed so that the expense to the power company for any type of domestic water heater control system is unjustified. My analysis of this problem leads to an entirely different conclusion which I submit to you in brief form for your criticism.

The capital investment by many power companies for a domestic customer is not less than $300 per kw. The average diversified loads of domestic water heaters are considered to be about 600 w, but at some parts of the day it might be 1,000 w. Therefore, if this water heater load occurs at the time of distribution system peak load, the capital investment for supplying this load would be $300. By providing a suitable device for interrupting the water heater loads, this $300 investment per customer will be avoided. A satisfactory device for interrupting or reducing water heater loads may be purchased for not over $15. Therefore, under these conditions a very substantial saving would be effected.

You, perhaps, may disagree with my basic figures; but if the capital investment per customer should be only $100 per kw and the water heater load at time of system peak should be only 500 w, a saving of $50 per customer would be effected with an expenditure of only $15. The fact that domestic loads other than that of water heaters has now become very large does not change the added load caused by the water heaters. Whether the heaters have high wattage or low wattage elements does not change the diversified water heater load.

Perhaps there is some pertinent element in this problem which I have overlooked and which might tend to change my conclusions. If so, I would be very glad to have your comments.

J. K. Ostrander
Consulting Electrical Engineer
United Engineers & Constructors Inc.
1401 Arch Street
Philadelphia 5, Pa.

• There is certainly nothing wrong with the data supplied by Mr Ostrander, and his suggestion may prove to be a satisfactory solution to the problem. But no matter the cost, utilities will have to do something about the increasing dissatisfaction with controlled water heating. EW does not want to see the water heating load taken over by other fuels. For confirmation that this is happening, see the editorial, "Give the Customer What He Wants," on page 84 of the July 12 issue.

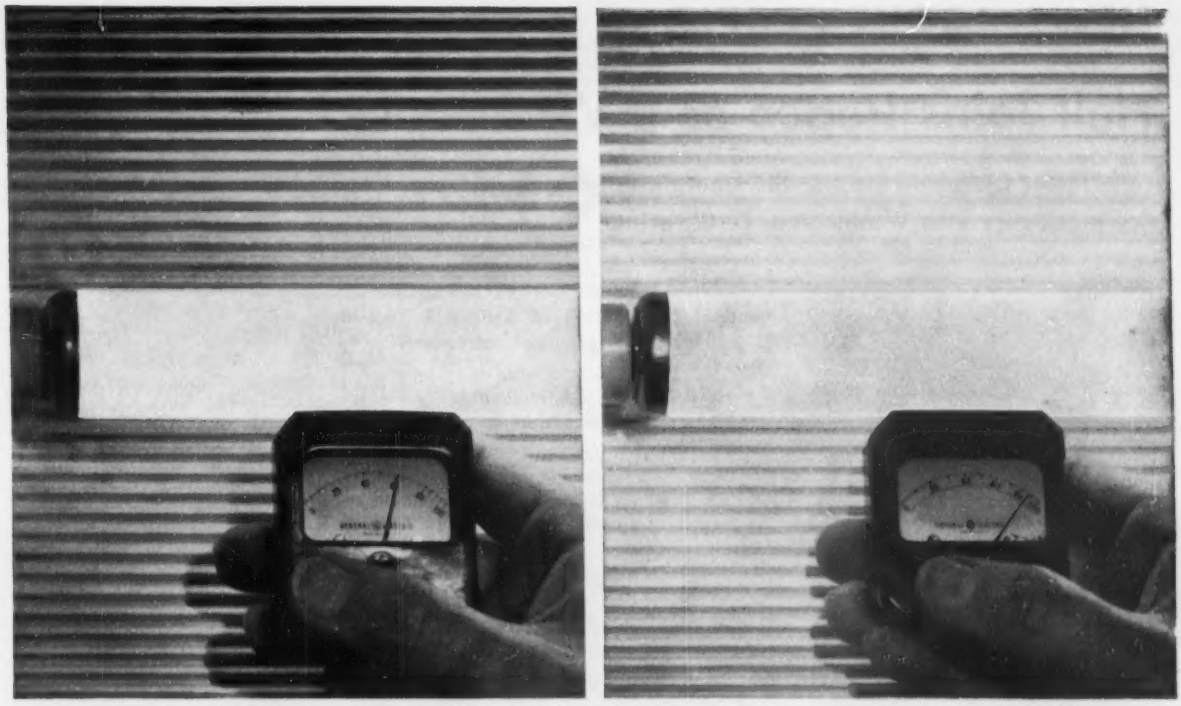
Retaining-Ring Metal Was Standard

To the Editor:

My attention has been drawn to a note under your heading, "The Electrical Week," on page 79 of Electrical World for Aug. 9. Under the heading "The $67 million Richard L. Hearn Steam Plant in Toronto," you say "Engineers who built the plant's four units said the breakdown occurred because the wrong type of steel was used for manufacturing retaining rings." Not only was this statement not made, but it is totally untrue. The wrong type of steel was not used for the retaining rings but, in fact, a material which is practically a world standard composition for non-magnetic rotor end rings.

In view of the fact that this untrue statement contained in your journal has been copied and repeated very widely throughout the world, we should be glad to have an early correction of this statement, giving it full publicity.

Sir Claude Gibb
Chairman and Managing Director
C. A. Parson & Co, Ltd
Newcastle Upon Tyne 6, England



Regular slimline, left, gives 620 units of light. New High Output Rapid Start lamp, right, gives 840 units of light.

NEW GENERAL ELECTRIC FLUORESCENT LAMP GIVES ⅓ MORE LIGHT THAN ANY PREVIOUS FLUORESCENT

LIGHTS ALMOST INSTANTLY—General Electric announces the most important advance in fluorescent lighting in 10 years: the new High Output Rapid Start fluorescent lamp. The 96-inch High Output lamp gives 36% more light than the most powerful G-E fluorescent lamp previously available.

For new installations, General Electric High Output lamps offer this ⅓ bonus of light without increasing the number of fixtures or maintenance costs.

This big increase in light, with no increase in lamp size, has been achieved through a special cathode developed by General Electric which permits a boost in lamp wattage to 100. Because the cathode is of the famous General Electric triple coil design, these Rapid Start lamps light up almost instantly. General Electric High Output lamps have a rated life of 7,500 hours, the same as all General Electric general lighting fluorescent lamps.

A new G-E base and socket design protects the lamp contacts by recessing them. A simple push-pull sets the lamp in its fixtures.

HAS VARIETY OF USES

The new General Electric High Output fluorescent lamp is especially suited for use in areas with high ceilings, in factories, warehouses, offices and stores. Also in store windows, showcases and other places where you want higher lighting levels in keeping with the modern trend. New fixtures designed for the G-E High Output lamp will soon be available from a number of lighting fixture manufacturers.

For information, write to Lamp Division, General Electric Company, Dept. 166-EW-11, Nela Park, Cleveland 12, Ohio.

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GENERAL ELECTRIC

NEWS ABOUT PEOPLE

Hall Joins Pepco as a VP

Former Cleveland Electric Illuminating Co official assumes vice presidency with Washington, D. C., utility

SYDNEY L. HALL

Potomac Electric Power Co has announced the election of Sydney L. Hall as a vice president, effective Dec. 1.

Associated with the utility industry for 20 years, Hall served as an officer of Cleveland Electric Illuminating Co for more than 15 years. He went to CEI in 1933 as clerical assistant to the treasurer. He was named assistant treasurer in 1934 and secretary in 1935. He was advanced in 1940 to vice president and secretary.

Hall resigned these CEI posts in December, 1952, to accept a vice presidency with Clevite Corp, Cleveland, which he has left to assume the Pepco position.

Wall Elected Vice President

Consumers Power Co places utility veteran in charge of electric production and transmission. Lamley advanced

HARRY R. WALL

Harry R. Wall has been elected vice president in charge of electric production and transmission of Consumers Power Co. Wall, previously general supervisor of electric production and transmission operations, succeeds the late Carl E. Arvidson (EW, Nov. 1, p 166).

Roland A. Lamley, former budget and new facilities supervisor in the department, will replace Wall as general supervisor of electric production and transmission operations.

Prior to joining Consumers Power in 1951, Wall was employed with Commonwealth Associates, Inc, engineering subsidiary of Commonwealth Services, Inc, and earlier with Commonwealth & Southern Corp.

Wall, a graduate of Carnegie Institute of Technology, is a member of American Institute of Electrical Engineers and National Society of Professional Engineers.

•

Charles H. Goddard has been made manager of utility sales for Sylvania Electric Products, Inc. Previously Goddard was in charge of marketing and product planning for the firm's Lighting Division. Goddard, who has been closely associated with the electrical industry since 1929, became a member of the Sylvania organization in 1944 as merchandising manager of lighting fixtures. He will make his office at the Lighting Division headquarters at Salem, Mass.

F. M. Thuney, former Washington, D. C. branch manager for Minneapolis-Honeywell Regulator Co, has been promoted to manager of the contract division in the firm's Industrial Division plant at Philadelphia. In another appointment, **J. W. Bowers,** former Grand Rapids, Mich., manager, was named to head a newly created department of service and repair controls for commercial establishments with headquarters at Minneapolis.

C. R. Stockhus and **W. L. Jones** have been named heads of two new departments under separation of personnel functions of Union Electric Co of Missouri. Under the reorganization, Stockhus, formerly supervisor of the employee relations and planning division, was appointed director of labor relations. Jones, formerly administrator of the management development program, was named director of employee relations.

Clifford H. Keen, who has been associated with Hubbard & Co since 1923 in various sales capacities, has been named assistant general sales manager.

American Welding Society Appoints New Officers

American Welding Society has elected Joseph H. Humberstone, president of Air Reduction Sales Co, Inc, New York, as its new president. Humberstone succeeds Fred L. Plummer, director of engineering, Hammond Iron Works, Warren, Pa.

The society also elected these officers: First vice president, J. J. Chyle, director of welding research, A. O. Smith Corp; and second vice president, C. P. Sander, general superintendent of Vernon, Calif., plant of Consolidated Western Steel Division, United States Steel Co.

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Sure we like big orders—and we handle them easily, every day, because our stocks are the world's largest, our cutting and handling facilities unsurpassed. But our business depends on small orders as well, and you'll find we never lose sight of this fact. Whether you want one bar or a thousand—one sheet or many tons, you'll get courteous service—quick delivery. Dependable, certified quality, too. Call us and see.

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AT THE POWER SHOW

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POWER AND MECHANICAL ENGINEERING

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Questions and answers will be the order of the day—every day—at the POWER SHOW! Leading manufacturers of mechanical, steam, electrical, hydraulic and pneumatic power equipment will have their technical representatives on hand to supply the information you will need to make up-to-the-minute improvements in your plant operation.

Look for the demonstrations of:
New ideas for reducing costs, increasing efficiency, improving product design—

New methods of power production, distribution, utilization and maintenance.

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Management: INTERNATIONAL EXPOSITION CO.
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Alabama Power Reveals Engineering Promotions

Alabama Power Co has announced a number of transmission and distribution promotions. They are as follows:

L. C. Flournoy, superintendent of distribution, was promoted to assistant manager of transmission and distribution. P. C. O'Shee, who has worked for several years directly under Flournoy as his assistant, succeeds him as superintendent of distribution.

Senior Distribution Engineer R. T. Garlington was advanced to assistant superintendent of distribution, replacing O'Shee.

L. B. Murray, superintendent of miscellaneous operations, was made superintendent of transmission. For the time being, Murray will continue to be responsible for miscellaneous operations. Reporting to Murray as senior engineer of miscellaneous operations will be A. R. Barton. Barton's duties and responsibilities in connection with North Birmingham Shops, Gorgas Housing, Birmingham Steam Heat, and miscellaneous buildings are being expanded.

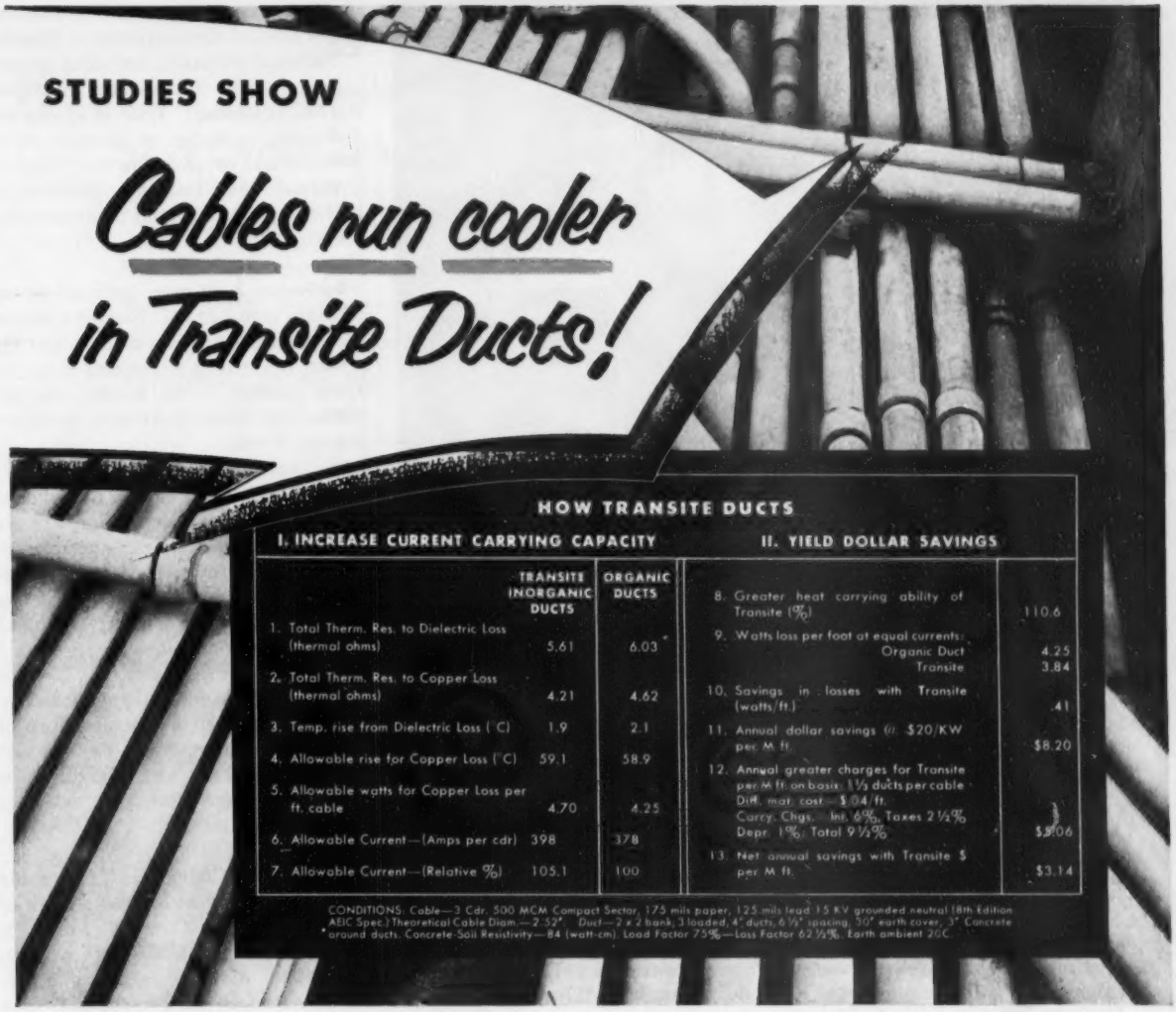
R. G. Myers was assigned special duties in the office of manager of transmission and distribution. T. D. Wood, Jr, senior engineer of communications, was promoted to supervisor of communications.

•

Charles L. Bullock, commercial-industrial manager of the Central Division of Ohio Power Co, has been made division commercial manager. **Robert H. Masters,** assistant division commercial-industrial manager, has been appointed division commercial-industrial supervisor.

Howard J. Ashe has been appointed operations and maintenance supervisor in the Seattle area office of Bonneville Power Administration. Ashe's appointment to that post was made after his former position of power manager was abolished. In other changes **R. W. Fantz** was made area administrative officer to succeed B. E. Stevenson, who resigned to go into private business.

Dr Arthur Lee Davis has been named general manager of the Electro-Technical Products Division of Sun Chemical Corp. From headquarters at the firm's Nutley, N. J., plant, Dr Davis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Cables run cooler in Transite Ducts!
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II. YIELD DOLLAR SAVINGS
TRANSITE INORGANIC DUCTS
ORGANIC DUCTS
1. Total Therm. Res. to Dielectric Loss (thermal ohms) 5.61 6.03
2. Total Therm. Res. to Copper Loss (thermal ohms) 4.21 4.62
3. Temp. rise from Dielectric Loss (°C) 1.9 2.1
4. Allowable rise for Copper Loss (°C) 59.1 58.9
5. Allowable watts for Copper Loss per ft. cable 4.70 4.25
6. Allowable Current—(Amps per cdr) 398 378
7. Allowable Current—(Relative %) 105.1 100
8. Greater heat carrying ability of Transite (%) 110.6
9. Watts loss per foot at equal currents: Organic Duct 4.25 Transite 3.84
10. Savings in losses with Transite (watts/ft.) .41
11. Annual dollar savings @ $20/KW per M ft. $8.20
12. Annual greater charges for Transite per M ft. on basis: 1½ ducts per cable Diff. mat. cost—$.04/ft. Carry. Chgs.—Int. 6%, Taxes 2½% Depr. 1%; Total 9½% $5.06
13. Net annual savings with Transite $ per M ft. $3.14
CONDITIONS: Cable—3 Cdr. 500 MCM Compact Sector, 175 mils paper, 125 mils lead 15 KV grounded neutral (8th Edition AEIC Spec.) Theoretical Cable Diam.—2.52". Duct—2 x 2 bank, 3 loaded, 4" ducts, 6½" spacing, 30" earth cover, 3" Concrete around ducts. Concrete-Soil Resistivity—84 (watt-cm). Load Factor 75%—Loss Factor 62½%. Earth ambient 20C.

copper losses reduced . . . current capacity increased . . . insulation life prolonged

TESTS have been made for many years by the Johns-Manville Research Center, to determine how Transite Ducts improve the dissipation of heat by conductors under load. The application of the test results is summarized above.

The figures prove that Transite Ducts will carry heavier current loads than organic ducts when sheath temperatures are the same. The result is a cooler cable under a given load . . . lower I^2R losses . . . longer insulation life from lower operating temperatures.

Transite Ducts offer many other advantages, too. Made of asbestos-cement, they are incombustible, resistant to corrosion, unaffected by electrolysis. When arcing occurs, Transite protects adjacent cables from damage. These durable, light-weight ducts provide complete and permanent cable protection, together with savings on installation and maintenance.

For complete details on these tests and the many advantages of Transite Ducts, write for free copy of Brochure EL-29A. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

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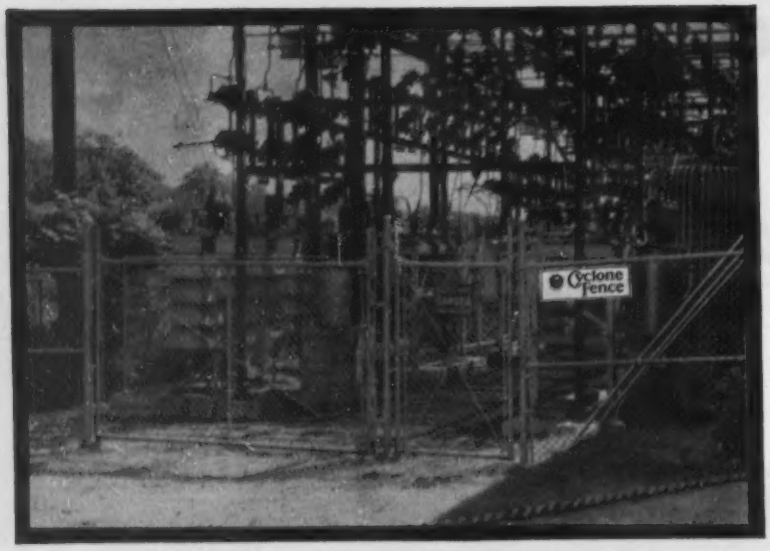
Johns-Manville TRANSITE DUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement



"Inside-Outside" Protection for Power Plants

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With Cyclone Fence on guard at your power station you get two kinds of protection. The power plant *inside* with the priceless equipment and services is guarded from damage . . . and pedestrians, trespassers and playing children are kept *outside*, away from high voltage wires, powerful generators and other dangers.

Cyclone Fence's ability to form a tight, strong, sturdy enclosure around all types of industrial, municipal and private establishments has won it an unexcelled place. Cyclone Fence today is the most widely-used property protection fence in the world.

You can buy cheaper fence than Cyclone, but it will cost you more in the long run. Cyclone gives full value for your dollar. Nothing but brand-new, top-quality material is used throughout. The chain link fabric is woven from heavy steel wire and galvanized *after* weaving for greatest resistance to rust. Erection is handled by full-time, well-trained experts. Cyclone's experienced engineers will be glad to give you more information and advice on your particular fencing problem.

NO JOB IS TOO LARGE—NO JOB IS TOO SMALL FOR CYCLONE*

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UNITED STATES STEEL CORPORATION
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USS

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USS CYCLONE FENCE

UNITED STATES STEEL

will supervise research, production and sales of the entire line of Electro-Technical Products, including insulating materials for electric and electronic equipment. Prior to joining the division, he served as manager of research and development for Irvington Varnish and Insulator Division of Minnesota Mining and Manufacturing Company.

Lawrence J. Donley, assistant advertising manager of Northern States Power Co for the past 26 years, has been elevated to advertising manager. He succeeds **T. H. Kettle,** who has retired after 40 years with Northern States Power.

Dr W. H. Brandt has been named head of Westinghouse Electric Corp's newly formed new products engineering department. Prior to his latest appointment, Dr Brandt was manager of special products development. He joined Westinghouse in 1936.

E. W. Falk has been appointed commercial engineer of Mycalex Corp of America, Clifton, N. J. For the past 25 years Falk has been a plastics sales engineer in the New York office of General Electric Co.

George M. Coffey has been made manager of industrial brake sales of Wagner Electric Corp, St. Louis. In his new position Coffey will co-ordinate sales of industrial crane bridge brakes through the company's branch offices. Prior to the recent appointment Coffey completed 17 years as a sales engineer of transformers, motors, and industrial brakes in Wagner's Atlanta and St. Louis sales offices.

Thomas J. Hanlon, Jr, chairman of the board of directors of Gulf States Utilities Co since 1947, has retired from the chairmanship, effective Nov. 1. He will, however, continue as a member of the board. Hanlon's chairmanship for the past seven years followed continuous service as an officer of the company since 1931.

Coleman Flick, former manager of the Jeffersonville district of Public Service Co of Indiana, Inc, succeeds retiring **Clifford Parrish** as manager of the Connersville district. **James E. Campbell,** former manager at Salem, takes over as Jeffersonville manager. **Marvin Heilig,** former

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Your choice of Pritchard to provide the modern power installation that meets your requirements gives you more than the exceptional benefits of Pritchard's proved design, engineering and construction skills.

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NEW ELECTRO SWITCH CATALOG

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Low-cost → *Dependable*

ROTARY MULTIPOLE SWITCHES for INSTRUMENT, TRANSFER, and SELECTOR SERVICE.

ESCO instrument switches permit control of complex circuits with a single compact switch instead of separate switches.

This catalog covers ESCO Type IP snap-acting switches, with up to four selector positions, handling 10 amperes at 120 volts a-c, 5 amperes at 240 volts a-c, 3 amperes at 450 volts a-c or 5 amperes at 125 volts d-c, 3 amperes at 250 volts d-c.

The catalog also lists ESCO IJR detent-action switches with up to eight selector positions, handling 10 amperes at 125 volts a-c or 5 amperes at 125 volts d-c.

The basic structure of ESCO rotary switches provides for extreme flexibility in design. Tell us your circuit arrangements and the sequences you need, and we will recommend the correct switch for your use.

Write TODAY for your copy of this new catalog.

ELECTRO SWITCH
CORPORATION
Weymouth 88, Massachusetts

Charlestown local representative, was promoted to Salem manager. **William F. Brown,** formerly Marengo local representative, was made local representative at Charlestown, and **Wilbur Jones,** formerly Corydon lineman, was elevated to Marengo local representative.

Donald B. Vail has been elected vice president of Commonwealth Services, Inc. Before joining Commonwealth in 1950, Vail was a vice president of Irving Trust Co, New York.

OBITUARY

Oscar F. Funk, 60, former vice president of Union Electric Co of Missouri, died Oct. 30 at St. Louis. Funk, who resided in Mackinac Island, Mich., resigned in 1938 as vice president in charge of accounts of Union Electric after 20 years' service. He was made a vice president in 1935.

Richard E. Holmes, chief engineer of the Air Conditioning and Refrigeration Division at Worthington Corp's Holyoke Works, died Oct. 15. Prior to joining Worthington in 1950, Holmes had been ventilation and refrigeration engineer at the Argonne National Laboratory, Atomic Energy Commission, Chicago. At one time he was in charge of development and design engineering of air conditioning products for Westinghouse Electric Corp. He was the author of the book "Air Conditioning in Summer and Winter."

William W. Moore, manager of the Toledo district office of Allis-Chalmers Manufacturing Co's General Machinery Division, died Oct. 20. Moore was a sales representative in A-C's Detroit district office before being named manager of the Toledo District office in 1949. He was affiliated with A-C from 1919 to 1930 and later returned in 1945.

James E. Stewart, 69, retired West Penn Power Co hydroelectric power engineer, died Oct. 24 at Laguna Beach, Calif. Stewart spent over 27 years with West Penn Power in the Pittsburgh area prior to his retirement in November, 1950, as hydroelectric engineer. From 1912 until 1923 he served with the U. S. Geological Survey.

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... The Only Organization With Years Of "Know-How" In BOTH *Electrical* And *Mechanical* Recovery Methods!

If you have any kind of a suspension-recovery problem—whether dust, fly ash, fume, fog or mists—it will pay you to bring it to the leading organization in the field ... WESTERN PRECIPITATION CORPORATION. Western Precipitation not only pioneered, over 44 years ago, the first commercial application of the now-famous COTTRELL Electrical Precipitators, but also has been a leader for many years in the *mechanical* recovery field with its widely-accepted MULTICLONE Collectors.

Result:

Western Precipitation is unsurpassed in the all-important factor of "know-how" in BOTH the electrical and mechanical fields ... knows from years of first-hand experience whether your particular problem can best be solved by mechanical or electrical methods—*or by a combination of the two* ... can give you a direct and unbiased recommendation on the matter ... and then can provide the complete installation under *one* responsibility, *one* overall performance guarantee, even where Combination Multiclone-Precipitator (CMP) installations are made!

Western Precipitation products and services include ...

COTTRELL

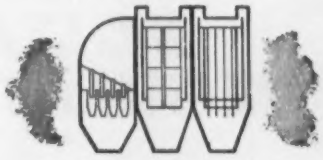
Electrical Precipitators

... the most efficient recovery equipment for high recovery, long life, low maintenance on practically any type of suspensions, wet or dry. COTTRELLS can be designed to handle a few c.f.m. —or millions—with equal ease, and at virtually any operating temperature. Recovery efficiencies closely approach 100% recovery, if desired, with very low draft loss, minimum power costs and negligible labor costs. *By all standards, Western Precipitation* COTTRELLS *give highest recovery at lowest cost per-year-of-service!*

MULTICLONE

Mechanical Collectors

... the most efficient, most compact, most trouble-free mechanical equipment for recovering suspensions from gases. Because of their unique small-tube design, MULTICLONES are unsurpassed in mechanical recovery efficiencies—require less space, less maintenance, and are far simpler to install. No filters or screens to replace, nothing to burn or cause fire hazards, no high speed moving parts to repair or replace. These and many other advantages make MULTICLONE Collectors the logical choice on installations where mechanical recovery is selected.



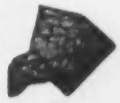
CMP UNITS

(Combination Multiclone-Precipitator)

... combine, in *one* compact installation, *both* mechanical and electrical recovery principles so that maximum benefit is obtained from the advantages inherent in each method. The MULTICLONE section centrifugally removes the larger and heavier suspensions (down to a few microns in diameter) ... and the COTTRELL section then electrically removes the very small particles remaining in the gases. Thus, the bulk of the recovery is obtained with relatively low-cost equipment, and the final clean-up is obtained with equipment having unusually high recovery efficiency—approaching theoretically perfect, if desired.

The recovery of suspensions from gases is a highly exact science and every problem is different. Some require mechanical methods—others electrical methods—still others a combination of mechanical and electrical methods in proper balance to meet the individual requirements of each application. No matter what your problem, remember that only Western Precipitation has had years of field experience in BOTH mechanical and electrical methods!

Send for descriptive literature!



Let our experienced engineers study your recovery requirements and make an unbiased recommendation on the equipment best suited to your particular problem. A wire, phone call or letter to our nearest office places this unique "know-how" at your service, without obligation.

WESTERN Precipitation CORPORATION

DESIGNERS AND MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

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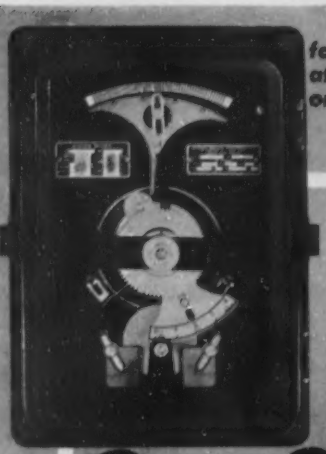

for 1750 kVA
at 1500 rpm
or higher

Sensitivity
—Longevity

MODEL JB 1/1
VOLTAGE
REGULATOR

BROWN
BOVERI

THIS remarkable voltage regulator, with a sensitivity of ½ of 1%, has set astonishing records of longevity. Users report 20 years and more of critical regulation and trouble-free operation. Such performance is the direct result of superb instrument design and craftsmanship applied to the best of materials.

TWICE ACTUAL
A pair of these tiny, floating ball bearings, supports the main arbor; the auxiliary arbor is borne by floating cup-type sapphire bearings.
All parts are machined to close tolerances for maximum reliability, accuracy and ruggedness.

The hand-wound regulating resistance in a model JB 1/1 is individually designed for each application. This voltage regulator is completely self-contained; it has no auxiliary box. Its precision fabricated components, like the ball bearing unit shown above, provide the "feather-touch" sensitivity of a laboratory meter with the ruggedness which long, uninterrupted operation requires. It conforms to MIL specifications.

You may be considering other voltage regulators but none can give you the *sensitivity, longevity, accuracy* and *reliability* of Model JB 1/1.
Fast Delivery! GET THE FACTS!

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New York, N. Y. • Portland, Ore. • San Francisco, Cal. • Seattle, Wash. • Tucson, Ariz.

British Columbia Power's Sales Up 32% in Fiscal '53

British Columbia Power Commission's sales jumped 32% last year, according to its new annual report for the year ended March 31. At the same time, the number of customers was up 6½% to 52,773, while cost to consumers was cut by an average of 8% in the commission's 27 districts.

Report stated gross revenue was $7,103,853, up 20% over previous year. Operating surplus was $531,-167 and net surplus $177,572 after commitments for repair of Whatshan power plant, damaged by two mud slides in August of last year.

Average cost of electricity to consumer was 2.4¢ per kwhr, down from 3.2¢ a kwhr in 1947.

The 44,321 residential users paid average of 2.7¢ and each used an average of 18% more electricity.

BCPC now has 7,416 commercial customers, up 4%.

During the year, commission increased its generating capacity 36% and built 34 mi of transmission lines and 230 mi of distribution lines.

Major construction completed in the year was a 20,000-kw unit at John Hart development at Campbell River. Construction is now underway on two hydro plants, a 4,000-kw unit on Spillimacheen River in Upper Columbia Valley, and a 25,000-kw unit on Puntledge River on Vancouver Island. Both are to be completed next spring.

Washington Co-op Votes to Continue Operation

A small northeastern Washington cooperative utility has voted to continue independent operation rather than consolidate with neighboring utilities or sell out. The decision followed a six-month controversy arising from the Pend Oreille Electric Cooperative's offer to sell to other co-ops, but not to the Washington Water Power Co.

About half the Pend Oreille co-op customers had voted, in a postcard election, for service by WWP if the co-op sold its properties.

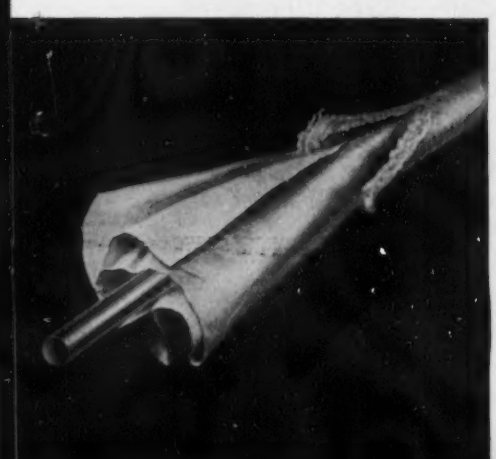
But 200 stockholders and their families, holding proxies for 250 other members, voted not to sell the cooperative on the advice of the retiring directors, who said the utility

WEATHERPROOF LINE WIRE

SLEET AND SNOW severely test line wire. In foul weather or fair, DURALINE provides greatest service dependability.

Here's how Anaconda's Duraline protects circuits

It cuts down outages and interferences in rain, snow and sleet



DURALINE* is completely unlike any other weatherproof line wire. It gives the *finest* weatherproofing and has longer life.

Note its continuous sheath of interlocked and felted, fibrous material—thoroughly impregnated with URC saturants and finished with URC finishers. Only Anaconda makes a line wire with this type protection.

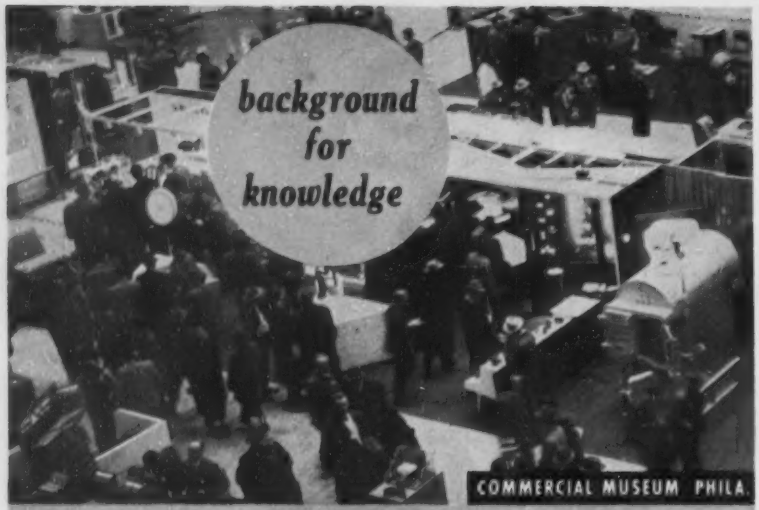
As a result, Duraline reduces grounds and shorts in wet, windy and icy weather. It protects against contact with foreign objects. It eliminates festooning.

Ask your Anaconda Sales Office for full information. Or write *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

*Reg. U. S. Pat. Off. 54378

ANACONDA®

Service and overhead distribution wires and cables, bare and weatherproof (neoprene, polyethylene and thermoplastic), including ACSR • signal, control and communication wire • portable cords and cables • mine cables • magnet wire • copper, aluminum and copperweld conductors • wire and cable accessories



Air Conditioning Exposition

12TH INTERNATIONAL HEATING & VENTILATING EXPOSITION

JANUARY 24-28, 1955

Over 400 leading manufacturers of air conditioning, heating and ventilating equipment will provide an outstanding background for specialized information in this greatest of all Air Conditioning Expositions!

Your increased knowledge of current improvements in air conditioning will help you to do a better job of load building.

DISCUSS plans and requirements with technically qualified personnel.

COMPARE competitive offerings for value and adaptability.

EXAMINE new trends and practices leading to revisions in electrical requirements.

For new ideas, important contacts and comprehensive information, attend the 12th Air Conditioning Exposition!

PLAN AHEAD FOR THIS IMPORTANT EVENT

Under the auspices of the American Society of Heating & Ventilating Engineers

Write for advance registration

Management: International Exposition Company, 480 Lexington Ave., N .Y. 17, N. Y.

"could and should continue to operate." There was little discussion and no protest of the advice or the voting.

The utility serves approximately 1,000 customers in Spokane and Pend Oreille Counties, Wash., and Bonner County in Idaho.

Colorado Amendment: Regulate All Utilities

A proposed amendment to the Colorado state constitution giving the Public Utilities Commission authority over all the privately owned utilities has drawn both support and opposition to the plan.

Supporting the amendment were the Colorado Engineering Council and the local legislative program workshop of the American Association of University Women.

Opposing it was the Colorado Association of REA Cooperatives. Its Pres George Wilson and Manager H. Vance Austin said the proposal would produce another law "loosely drawn, expensive to administer, totally unnecessary, and full of danger to the 22 Colorado rural electric firms."

Rural electric firms would "most surely" be brought under PUC regulation, they said, and described that result as "pointless" since the co-operatives have "the sole objective of furnishing farmers electricity at the lowest possible cost."

FINANCIAL BRIEF

Goodbody & Co has released its monthly letter on "The Dynamic Growth Prospects of the Electric Utility Industry." It recommends the following companies which have the greatest per common share growth prospects over a three to five year period: Arizona Public Service Co, Central & South West Corp, Florida Power & Light Co, and Texas Utilities Co. It also lists the following electric company common stocks for income purposes where income should be secure but where appreciation prospects might be less pronounced over this same period: Commonwealth Edison Co, Kansas City Power & Light Co, Oklahoma Gas & Electric Co, Southern California Edison Co, and Virginia Electric & Power Co. For copy of the letter, write Ted Locke, 115 Broadway, New York 6.

BATTERY MAINTENANCE TIP #2

from the GOULD Plus-Performance Plan

BEST WAY TO REMOVE ELEMENT FROM JAR

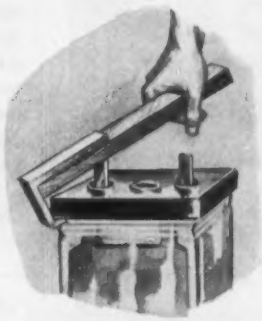
When accidental damage requires installing an element in a new jar, the next step after removing the cell from the tray, is to pull the element from the jar. The Gould Plus-Performance Plan shows you how this can be done quickly in three easy steps.

1. *Remove Cell*

Where not possible to remove cell and maintain the circuit by installing a connection jumping out the cell, use a 3 cell Automotive or small power battery and parallel with that section of main battery from which the cell is to be removed. Keep these parallel leads to the rear and out of the working area.

2. *Lift Element From Jar*

Remove seal nuts. Make an L shaped tool and remove cover using a wood board for lever. Lift element out of jar and install in new jar after placing compound on element supports. Neutralize acid on cover. Remove and replace old sealing compound. Install cover.



3. *To Replace a Cover*

Simply unscrew the lead alloy nuts from around each terminal post. This removes compression from acid-resistant, soft rubber post seals, allowing cover to be raised over the posts as in "2." It is always best to replace these rubber post seal grommets when installing new cover. Press new cover, filled with compound, into place, making sure grommets project above cover, and screw alloy nuts down tightly.

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Batteries

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TRENTON 7, N. J.

For Railroad Air Conditioning and Lighting | For Mine Shuttle Cars and Locomotives | For Electric Industrial Trucks | For Diesel Locomotive Starting | For Standby and Emergency Power

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Always Use Gould-National Automobile and Truck Batteries

This is only one example of the many helpful service tips contained in the Gould Plus-Performance Plan. For the complete set of published information on battery service and maintenance mail the coupon TODAY.

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Dept. EW-114 Trenton 7, N. J.

Please send me, without charge or obligation, the Gould Plus-Performance Plan for _____ batteries.
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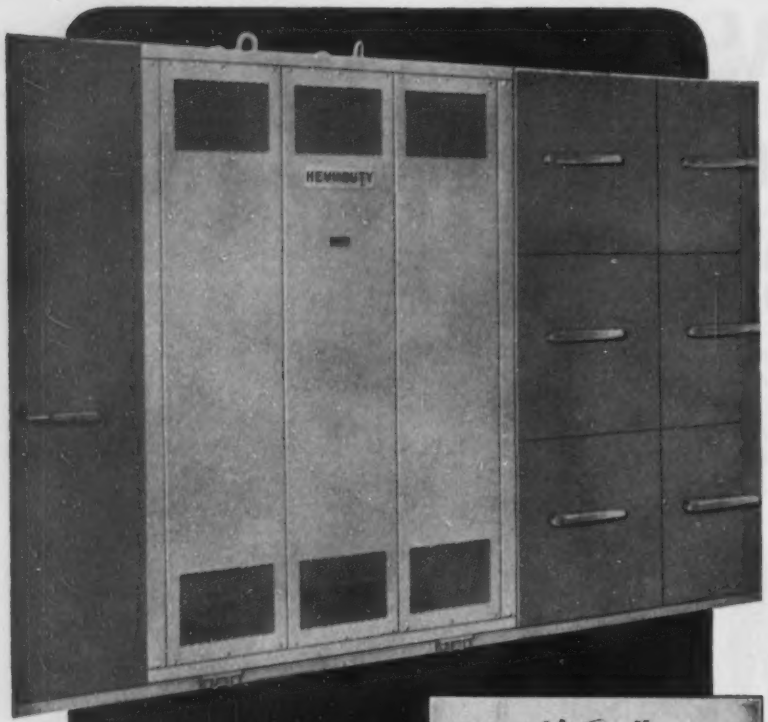
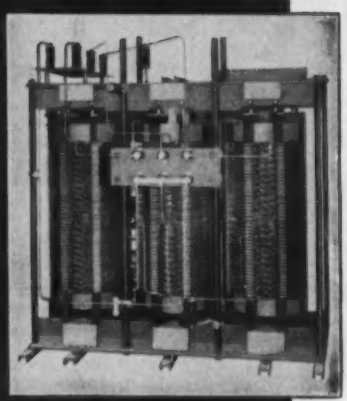


HEVI DUTY

High Voltage Unit Sub-Station Transformers



INCREASE EFFICIENCY OF LIGHTING AND POWER CIRCUITS BY SUPPLYING EQUIPMENT WITH THE CORRECT VOLTAGE

When you need electric power, you can count on Hevi Duty Dry Type Transformers for dependable service. These transformers are engineered to meet or exceed all the requirements necessary for long life.

Note the adequate core and coil blocking, high voltage insulators and well ventilated pancake type coils on the Type 31FH, 300 KVA, 13,200-208Y/120 volt, 60 cycle Transformer shown here.

Hevi Duty Dry Type Transformers can be supplied separately or as a Unit Sub-Station complete with primary and secondary switch gear according to your specifications.

Write for Bulletin HD-499.

HEVI DUTY ELECTRIC COMPANY

MILWAUKEE 1, WISCONSIN

Heat Treating Furnaces... Electric Exclusively

Dry Type Transformers *Constant Current Regulators*

Heat Storage

(*Continued from page* 134)

would be more nearly correct, which would be equivalent to about 56,500 at 15 below.

Space for Equipment . . . The heat pump, heat storage tank, well pump, pumps, and air-coil circulating pumps are housed in a 4-ft-deep concrete pit under a new 10 by 20 ft utility room at the back of the house. Air-handling equipment is in the crawl-space under the center of the basementless house. The heat pump has a 5-hp sealed-in motor-compressor unit and is basically a "package unit" liquid chiller.

Heat Source . . . The heat source used is well water, flowing through the ground toward the lake, not lake water, and its static level is about 4 ft below the position of the pump. Its temperature remained steady within one degree of 51F throughout the heating season.

What Changes . . . If starting over now, I would use a 3- instead of a 5-hp compressor. This would not meet the design heat loss of the house, but this could easily be compensated for on the few occasions necessary. Our house is larger than average, and I am satisfied that a 3-hp compressor is sufficient in this climate for the average-sized house that is tight and very well insulated.

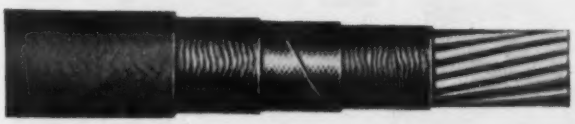
Saline Water Conversion Tests Will Start Soon

First field tests under the government's saline water conversion program is about to start at Buckeye, Ariz., appropriately enough, in the Salt River Valley. Further tests will follow next year at Miller, S. D.

Ionics Inc, of Cambridge, Mass., and the Department of Interior are conducting the research at a Buckeye Irrigation District well. The well met test specifications of containing 4,500 parts per million of soluble salts.

Ionics has developed an electrical membrane water demineralization apparatus. It holds a $97,770 contract with Interior Department to see what can be done to make brackish waters potable.

YOUR PLANT CAN GROW



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(N.E.C. TYPE AVA)

WIRE AND CABLE

When you're building your plant, that's the time to install Rockbestos A.V.C. and you will automatically add 30 to 50% more current capacity for future needs.

Get the full story on the practical advantages of Rockbestos A.V.C. — the cable that gives you room to grow.

Phone or write the nearest branch office for a Rockbestos Field Engineer. He's a wire specialist who can save you time and money on your wiring problems.

STOCKED COAST TO COAST

Standard Rockbestos A.V.C. (N.E.C. types AVA, AVB, etc.) are available from stock for immediate shipment. Call or write nearest branch office.

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OAKLAND, CALIFORNIA • SEATTLE

Supercritical Pressure

(*Continued from page* 119)

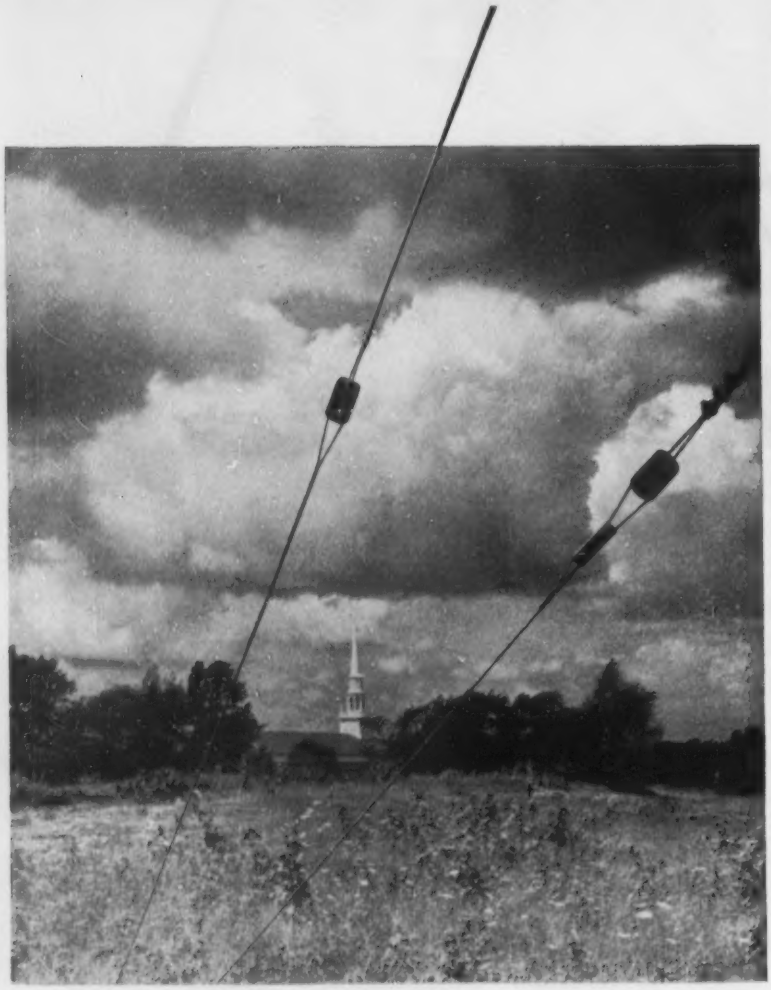
Water Treatment . . . Successful operation of the supercritical cycle depends in great measure on attaining a feedwater practically free of dissolved gases and solids. Advances in demineralization processes make this goal possible. The estimated ½% makeup for this installation, and possibly a portion of the condensate as well, can be treated by this method to assure that water entering the boiler cycle is of a purity of less than 0.1 ppm of solids.

Possible demineralization of a portion of the condensate is merely insurance against any slight condenser leakage or other contamination. Actually electronic controlled rolling of condenser tubing is expected to reduce any condenser leakage to negligible amounts. If further tests indicate the presence of any other contamination such as organic solids that may get through the demineralization process, an evaporator will be employed. Chemicals that may be used after demineralization treatment are some volatile alkalies to prevent iron and copper pickup in the preboiler system and remove traces of oxygen that escape the deaeration stages.

Because of the company's three years of experience in the field of demineralization, it is felt that the goal of pure water will be reached. The operating records of two monobed demineralizers indicate that purity in the order of 0.1 ppm inorganic solids is normally achieved. Sufficient experience in the use of advanced methods of condenser construction and maintenance has provided a record of negligible condenser leakage. No troubles are expected to arise from this potential trouble source.

Seattle to Alter License

Paul J. Raver, City Light superintendent at Seattle, has been authorized by the Seattle Board of Public Works to sign an amendment to its federal power license which will increase the power potential of Ross Dam on the Skagit River. Under the original license, City Light has had to maintain space behind the dam for 200,000 acre-ft of water between Nov. 1 and April 1. The new arrangement will lower the minimum to 120,000 acre-ft between Dec. 1 and March 1.



Guy-Grips*

BY PREFORMED

...Economical

...Neat

...Efficient

*at the left

PLP PREFORMED LINE PRODUCTS CO.
5349 ST. CLAIR AVE. • CLEVELAND 3, OHIO

Bell's new Telephone Answering Set. In use, the machine tells the caller when to start talking, and when his time—thirty seconds—is up.

He's out . . .
but he's answering his telephone!

This newly designed Bell Telephone Answering Set makes it possible for you to go out—but leave your voice behind.

Before you leave you twist a knob, dictate a message into your telephone, then switch the machine to "Automatic Answer." When somebody calls, the machine starts up and the caller hears your voice telling who you are, requesting his name and telephone number, repeating whatever you have said. The reply is recorded too. On your return you play back all the calls that have come in, as often as you please.

The new machine features "talking rubber," a Laboratories-developed recording medium made of rubber-like plastic and iron oxide which can be used over and over again millions of times. It is another example of how Bell Laboratories research works to help your local Bell Telephone Company serve you.

Bell Telephone Laboratories

Improving telephone service for America provides careers for men in scientific and technical fields

THE STATES COMPANY

STROBO TESTING

Faster, Easier, Relaxed

Why waste manpower and time when you can now test meters stroboscopically with States' up-to-the-minute Strobo Tables. Here is improved Strobo Testing efficiency combined with simplified Strobo Testing ease and comfort. It's no wonder that more and more companies are including States Strobo Equipped Tables in their 1955 budgets.

Strobo Light working like a flashlight is quickly projected either on the top or edge of meter disc.

Registration Indicator

Strobo Light being projected on edge of disc. "As found" readings may be made direct from Registration Indicator Dial.

One of many styles of Form "FRSS" Watthour Meter Test Tables with Strobo and photo-electric pick-up.
The table is equipped with a precision accuracy current transformer that permits the Strobo meter to operate always at 5 amperes.

THE STATES COMPANY
3 New Park Avenue, Hartford, Conn.
Please send me further information on STROBO TESTING.

Name .....
Company .....
Street .....
City .....Zone....State.....

USBR Office in Denver Dismisses 100 Experts

One hundred top-ranking engineers, designers and researchers in the Bureau of Reclamation's planning and engineering headquarters at Denver have been dismissed.

L. N. McClellan, assistant reclamation commissioner and chief engineer for the bureau, said "This reduction was necessitated by a cut in the Reclamation Bureau's budget voted by Congress last July."

The notices were sent out the second day after the Nov. 2 election but McClellan denied reports—current at the Denver Federal Center—that the dismissals had been held up until after the election for political reasons. He said the "reduction in force" had been imminent for "several months" because the bureau is not planning any large new construction.

McClellan said all of those to be discharged are in the higher civil service classifications and are experts in their fields. He said most of them "can do much better, as far as salary is concerned, in private industry."

Failure of the 83rd Congress to approve either the Frying Pan-Arkansas diversion project or the Upper Colorado Basin Project was blamed for the reduction.

Australia to Construct Nuclear Power Plant

MELBOURNE (McGraw-Hill World News) An advanced type of nuclear reactor will be constructed near Sydney for research into the use of atomic power for industry. The project is part of a cooperative program of atomic energy research between the governments of Australia and Britain.

The Australian government believes that production of electric power from nuclear sources will become an economic proposition within "probably the next ten years." Confidence in the economic success of reactor power plants in Australia stems from the fact that some important economic centers are located far from the coast and from hydrocarbon fuel sources or coal. Such centers are the Barrier mining district, which includes the world's biggest zinc-lead lode, and the Kalgoorlie Golden Mile. Mining

How to keep informed on the "with what" part of your business

AT YOUR FINGER TIPS, issue after issue, is one of your richest veins of job information—advertising. You might call it the "with what" type—which dovetails the "how" of the editorial pages. Easy to read, talking your language, geared specifically to the betterment of your business, this is the kind of practical data which may well help you do a job quicker, better—save your company money.

Each advertiser is obviously doing his level best to give you helpful information. By showing, through the advertising pages, how his product or service can benefit *you* and *your* company, he is taking *his* most efficient way toward a sale.

Add up all the advertisers and you've got a gold mine of current, on-the-job information. Yours for the reading are a wealth of data and facts on the very latest in products, services, tools . . . product developments, materials, processes, methods.

You, too, have a big stake in the advertising pages. Read them regularly, carefully to keep job-informed on the "with what" part of your business.

McGRAW-HILL PUBLICATIONS

for uranium is also carried on in districts remote from orthodox fuel sources. If these mining operations grow, they could utilize a portion of the output on the spot.

However, the experimental plant will be located just near enough Sydney as safety considerations will allow, and as near a source of sea or fresh water as possible. Professor J. P. Baxter, deputy chairman of the Australian Atomic Energy Commission, disclosed that the reactor will have a capacity of 10,000 kw.

McNary Fish Facilities Satisfy Army Engineers

A 10-month tabulation of salmon movement over 92-ft high in McNary Dam indicates the dam's $22.5 million fish passage facilities "have justified every expectation of their design," Army Corps of Engineers has announced.

The study by corps biologists covers three seasonal spawning runs of 1954 and relates counts at Columbia River's downstream Bonneville Dam, McNary 150 miles upstream and at Rock Island Dam another 150 miles further upstream.

"We are more than pleased with the McNary tabulation results for the past ten months, which cover the spring, summer and fall spawning runs of Chinook, Bluebacks and Steelhead," said Col A. H. Miller, district engineer of Walla Walla, Wash., corps office. "McNary Dam's fish passage facilities were on the proving block during this, their first year of operation, and they have justified every expectation of their design."

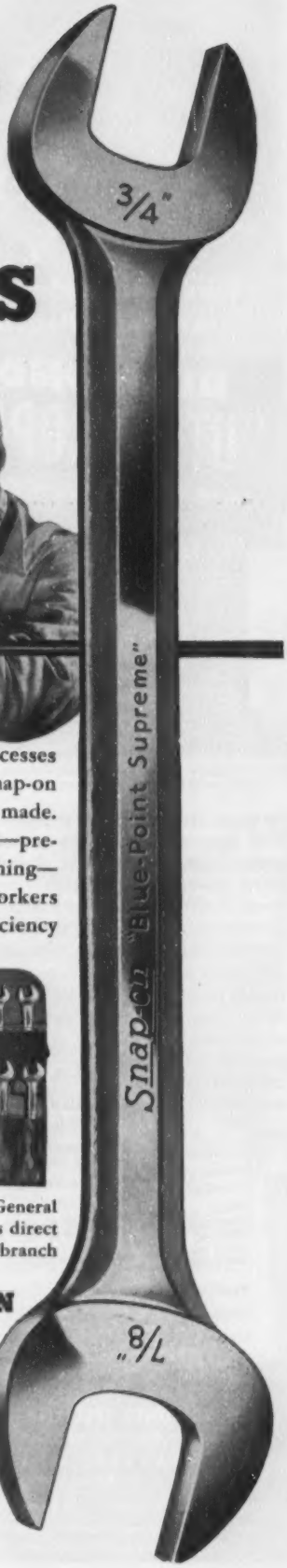
The tables show 320,063 Chinooks, 130,107 Bluebacks and 175,375 Steelhead crossed Bonneville counting station. Of these, 126,503 Chinook, 108,179 Bluebacks and 67,795 Steelhead reached McNary. Rock Island reported 33,238 Chinook, 91,234 Bluebacks and 4795 Steelhead traveled the 65 miles slackwater McNary pool and 95 miles of river to the upper Columbia. How many branched off to enter the Snake River is an unknown factor.

There are no past years tallies for the McNary point of the river, but corps notes an analysis of the 16 years, 1938 to 1953, for which records were kept at Bonneville and at Rock Island indicates upstream travel

Snap-on*

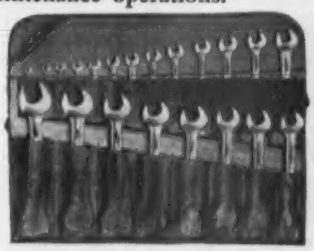
"Blue-Point Supreme"

Open End WRENCHES



For jobs like this—or where nuts are set in recesses too narrow for other types of wrenches—Snap-on open end wrenches are the strongest, safest made. Every detail of design—the tough alloy steel—precision machining—heat treatment and finishing—are highest quality. In the hands of your workers Snap-on wrenches will contribute greater efficiency to assembly and maintenance operations.

OE-821-K.
21 WRENCH SET
in kit as illustrated. Contains all standard sizes, ¼" to 1⅜". Most sizes duplicated on different handles to meet requirements of many jobs.



Write for Snap-on Industrial Catalog and General Catalog of 4000 hand and bench tools. Snap-on gives direct service to industry everywhere through factory branch warehouses in principal industrial centers.

SNAP-ON TOOLS CORPORATION
8108-K 28th Avenue, Kenosha, Wisconsin

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NO WRESTLERS
NO GIVEAWAYS
NO COMEDIANS
This Television is for Your Profit
DIAMOND "UTILISCOPE"®
(WIRED TELEVISION FOR INDUSTRY)

"Utiliscope" screen at control pulpit of tube mill with camera at furnace entrance saves a man.

"Utiliscope" is strictly a business proposition . . . never makes any attempt at entertainment. It watches, operations too remote, too inaccessible, too hot, too dangerous or too expensive to observe directly. It gives the operator a clear, sharp picture of what is happening every instant. And it is rugged . . . stands dirt, heat, vibration, rough handling . . . lasts for years with negligible maintenance. Probably you have one or more operations where the "Utiliscope" will cut costs, improve quality, promote safety or increase production. Use the coupon to get Bulletin 1136 which contains numerous suggestions.

6946 "Utiliscope" Camera

DIAMOND POWER SPECIALTY CORP. W LANCASTER, OHIO

Please send me without obligation a copy of new Bulletin No. 1136 showing how the Diamond "Utiliscope" (Wired Television) is being used to cut costs, improve operations and promote safety.

Name_____
Company_____
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FIRST IN INDUSTRIAL TELEVISION
LANCASTER, OHIO
OFFICES IN 39 PRINCIPAL CITIES
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was above average. For example, the records show that on an average 3.1% of Chinooks, 50.1% of Bluebacks and 2% of Steelhead passing Bonneville reached Rock Island.

During the 10 month count at McNary, the percentage of Bonneville count reaching Rock Island jumped 10.4%, 70.1% and 2.7%. Corps biologists say this indicates the fallacy of claims that McNary, the highest dam on the main stem below the forks of the Columbia and Snake, would prove too great a hindrance to the upstream spawning.

U. S. Fish and Wildlife and Oregon and Washington fish commissions have disagreed with earlier corps evaluations of fish count data, however, and have not yet issued statements on the latest corps findings.

The dam has fish ladders on both banks, Washington and Oregon, consisting of gravity-type structures 30 ft wide with a slope of 1 to 20. A supplemental lock of elevator type and one experimental type pressure fish lock also were included in the design. Ladder flow from the pool is 180 cfs augmented on the Oregon side by several thousand cfs of fish attraction water provided by a three unit pumping station. Attraction water on the Washington shore ladder is provided by gravity.

PG&E Plans to Continue Rainmaking Experiments

Pacific Gas & Electric Co will conduct more cloud-seeding experiments in the Sierra Nevada during the coming months, with the objective of increasing the winter snowpack to provide additional runoff for hydroelectric plants next summer.

While results of the company's cloud-seeding efforts for the past two years are incomplete, they are encouraging enough to justify continuing the experiments, PG&E officials report.

Work will be handled by North American Weather Consultants of Altadena, Calif., using ground-based silver iodide crystal generators. "Target" areas will be the Lake Almanor watershed in the northern Sierra, the upper Mokelumne and Stanislaus River watersheds of the central Sierra, and the Bass Lake watershed south and east of Yosemite Valley.

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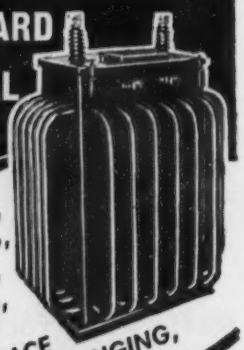

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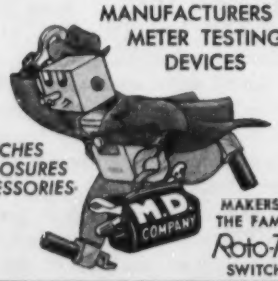

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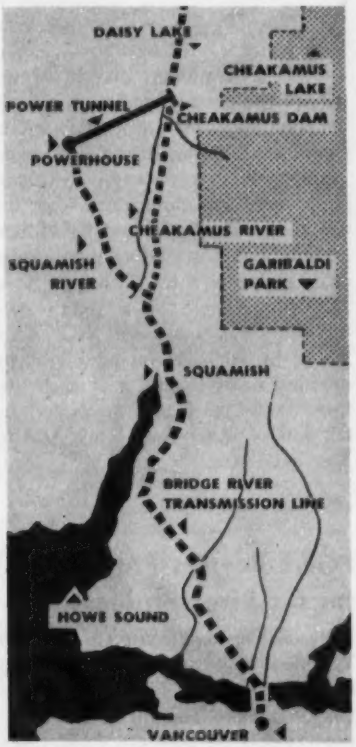
BCE Plans Hydro Project on Cheakamus River

British Columbia Electric Co will let contracts within a few weeks for its $25-million hydroelectric project on the Cheakamus River 14 miles north of Squamish (70 miles north of Vancouver) and construction will get under way before the end of the year, according to Pres Dal Grauer.

Announcement that the company had applied for a water rights license to build the dam and power plant in the rugged Coast range was made the middle of last month and a license has not yet been granted.

Cheakamus River water will be harnessed and diverted to a power-



CHEAKAMUS project will develop 142,000 kw

house on the Squamish River to develop 142,000 kw.

Plans call for an earth and rock dam 90 ft high at maximum and measuring 2,000 ft along the crest, from which a 7-mile tunnel, 9 ft wide and 18 ft high, will carry water to the powerhouse downstream. Penstocks at the lower end of the tunnel will drop the water 900 ft to spin the turbines of the twin 71,000-kw generating units which will be the biggest yet installed in the BCE system.

Despite the mountainous terrain in

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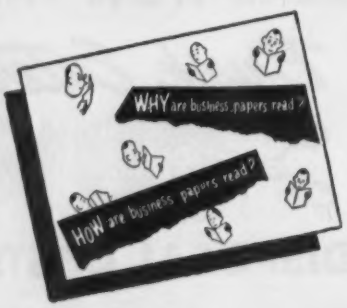

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which the plant will be built, the problem of getting the energy into Vancouver will be less difficult than with other BCE power projects, Grauer reported. Only 14 miles of transmission line will be required to tap the station into the Bridge River circuit at Cheekye, above Squamish. The energy will be transmitted to Vancouver at 230 kv.

1 Million-Kw Tidal Project Is Proposed for Alaska

Damming the tidal waters of Cook Inlet in Alaska for the generation of 1 million kw has been suggested to the Chugach Electric Association at Anchorage by Roy W. Johnson, consulting engineer of Seattle.

The $300-million project would require five years of engineering study but could be under construction within ten years, Johnson declared. It would require three causeway-type dams. Knik Arm, extending north from the end of Cook Inlet, would be kept at high-tide level by letting more water in on each high tide. Turnagain Arm, extending almost at a right angle both to Cook Inlet and Knik Arm, would be kept at low-tide level by draining water out of it at each low tide. Power would be generated by the flow of water from Knik Arm to Turnagain Arm.

PG&E Revises Proposals for Pit River Projects

Pacific Gas & Electric Co has filed amended applications with Federal Power Commission for licenses for its proposed Pit 6 and Pit 7 hydroelectric projects on northern California's Pit River. The plants would develop 164,000 kw of power, 50,000 kw more than planned originally.

Design changes will enable the two plants to make use of McCloud River water which would flow into the Pit River after construction of another project, the McCloud-Pit, for which application is now before FPC.

Under the new proposal, PG&E would spend only $17 million for Pit 6, instead of the $19.7 million originally planned, but it would develop 66,000 kw instead of 60,000 kw.

Revised plans for Pit 7 call for a jump from 54,000 kw to 98,000 kw.

The plant, originally scheduled to cost $16,250,000, would cost $24 million.

If all the proposed plants are built, PG&E's total investment in the Pit River system will amount to some $155 million. Besides Pit 6 and Pit 7, there is the McCloud-Pit development, which will cost $89 million and will develop 232,000 kw in its two powerhouses. Under construction is Pit 4, costing $25 million and generating 84,000 kw, which will go into service early next year.

These projects, plus existing plants Hat Creek 1, Hat Creek 2, Pit 3 and Pit 5, will allow maximum utilization of the water power resources of the McCloud and Pit Rivers and their tributaries, according to the revised license applications filed with FPC. With all existing and proposed plants in service, the company's generating capacity on the Pit-McCloud river system will total 776,000 kw.

APDA Appoints Mort as Its New President

New officers of the American Power Dispatchers Association elected at the fall meeting in Los Angeles Oct. 29-30 include: President, R. W. Mort, Southern California Edison Co; vice president, D. P. Bengtsson, Los Angeles Department of Water and Power; and secretary-treasurer, R. F. Davis, Southern California Edison.

Agenda of the two-day parley included an address by C. R. Canady, operating engineer, Southern California Edison, on modern load-frequency control and by W. E. Montgomery, manager of operation, Southern California Edison on "Management and the APA." The program also included a tour of the Valley Steam Plant of the Department of Water and Power of the City of Los Angeles.

New Fly Ash Use Tests

Continuing its program to develop markets for fly ash, Duquesne Light Co has followed its demonstration bituminous roadway, built last year at Phillips Plant, with a concrete roadway at Elrama Plant. The 160-ft long demonstration section, just completed, is testing fly ash use as 10, 20 and 25% replacement of the normal amount of Portland cement.

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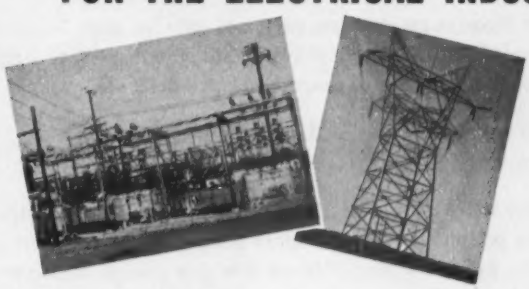

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ELECTRICAL CONDUCTOR SALES

Kaiser Aluminum offers three technical sales positions in Milwaukee, Indianapolis, and Los Angeles for well-qualified, experienced men in the electrical utility industry, preferably in sales. Sales contacts made on executive, engineering and purchasing levels with electric utility companies and electrical distributors.

A major aluminum producer and the fastest growing company in the aluminum industry, Kaiser Aluminum offers excellent advancement opportunities.

Salary commensurate with experience. Please submit personal resume, including experience, age, present and desired salary. Photograph desired but not necessary. Write to

P-4471, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

REBUILT AND NEW

GUARANTEED MOTORS
M.G. SETS • GENERATORS
Hoists • Compressors • Transformers
Units of Every Size and Description

MOTOR GENERATOR SETS

K. W.	MAKE	A. C.	D. C.
1000 (2u)	Westg.	11000	137/275
500	Westg.	2300	137/275
500	Westg.	2300	275
400	A.C.	2300	120/240
250	Westg.	2300	125/250
200	G.E.	2300	250
200	Westg.	4160	250
200	Ridgeway	2300	250
170	G.E.	440	125
150	G.E.	2300	125/250
150	G.E.	4000	250
150	A.C.	2300	275
150	Westg.	2300	125/250
150	G.E.	440	275
100	G.E.	2300	250
100	Westg.	440	125
100	Elec. Mach.	440	125
100	G.E.	440	125
90	G.E.	440	60
75	G.E.	440	125
60	Westg.	2300	125
50	Reliance	440	250
50	Idea	2300	250
50	Westg.	240	125

WE'LL SELL, BUY OR TRADE
PHONE CANAL 6-2900
CHICAGO *Electric Co.*
1324 W. CERMAK ROAD
CHICAGO 8, ILL.

WORLD'S LARGEST INVENTORY

FREE CATALOG

MOTORS—GENERATORS—TRANSFORMERS
New and Guaranteed Rebuilt
1 H.P. to 2500 H.P.

ELECTRIC EQUIPMENT CO.
P. O. BOX 51, ROCHESTER 1, N.Y.

WANTED
Watthour Meters
Bottom Connected
The Electrical Watthour Meter Co.
76-15 Woodside Ave.
Elmhurst 73, N. Y. HA 9-0131

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

LOAD DISPATCHER — Established growing utility in one of most desirable locations in Brazil desires temporary services (about one year) of experienced technician to initiate dispatching service and train local personnel in its operation and maintenance. System is combination thermal and hydro with transmission up to 132 KV. Excellent opportunity for active retired experienced chief load dispatcher. Reply giving education, experience and personal particulars. P-4581, Electrical World.

ELECTRICAL ENGINEER — Junior or Assistant Distribution Engineer — technical graduate with at least 3 years field experience operating utility Company. Permanent position with long established consulting organization New York. Some travel Latin American necessary in future. Knowledge of Spanish or Portuguese useful. Salary commensurate with experience. Reply stating age, education, experience and personal particulars. P-4582, Electrical World.

DISTRIBUTION ENGINEERS — Require competent experienced graduate electrical engineers with approximately 10 years experience design, operation and maintenance of distribution facilities by established rapidly growing utility located South America and by long established service organization New York headquarters — some travel Latin America. Reply giving resume education, experience and personal data. P-4580, Electrical World.

SALES ENGINEER: Must have B.S. in E.E. Headquarters Birmingham, Alabama, representing leading insulated wire and cable manufacturer calling on utilities, industrials, engineers and wholesalers through part of Tennessee, Alabama, Mississippi and Arkansas. Starting salary approximately $400.00 per month, plus all expenses. Reply to 3028 Seventh Avenue, So., Birmingham, Alabama.

EMPLOYMENT SERVICE

SALARIED PERSONNEL $3,000-$25,000. This confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

PRODUCTIVE SALES and Management experience, calling on utilities and distributors; handling distribution and transmission equipment and material. Eight years in Southeastern section; wishes to relocate there, as employee or manufacturers representative. PW-3998, Electrical World.

WANTED
MANUFACTURER'S AGENT

For Direct Sales to Electric Utilities established line of electric meter testing and installation accessories and equipment — Territories — Montana, Nevada, North Dakota, South Dakota and Wyoming. Well known manufacturer selling Utilities for over 30 years.

Advise full particulars—Items now carried and territory covered. Replies held confidential.

RW-4505, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

POSITION WANTED

AVAILABLE FOR Brazil Electrical engineer with several years' experience with large American firm in Rio, good organized speaks fluent Portuguese. PW-4479, Electrical World.

PERIODICALS

A.I.E.E. transactions back-volumes wanted to buy for cash. Ashley 24 E. 21, N.Y.C. (10).

OFFICIAL PROPOSALS

Bids: December 17, 1954

Construction of Construction Power Facilities

POWER AUTHORITY OF THE STATE OF NEW YORK
NEAR MASSENA, ST. LAWRENCE COUNTY, NEW YORK
SPECIFICATION NO. PA-5-14036
ST. LAWRENCE CONTRACT NO. 7

NOTICE TO CONTRACTORS: The POWER AUTHORITY OF THE STATE OF NEW YORK will receive sealed proposals for the construction of construction power facilities near Massena, St. Lawrence County, New York until 10:30 a.m. Eastern Standard Time on the 17th day of December, 1954 at the Authority's office, 270 Broadway, Room 1207A, New York 7, New York, at which time and place proposals will be publicly opened and read aloud.

The principal items of work are:

1. A 115 KV transmission line, 3-phase, single circuit, approximately 3 miles long on H-frame wood poles. The conductors will be No. 3/0 A.C.S.R. The line will also be provided with a static line which will be installed on top of one of the poles of the H-frame and strung the whole length of the line.
2. Approximately 3.7 miles of double circuit, 3-phase 13.8 KV transmission line on H-frame wood poles. The six conductors for this line will be 336,400 circular mil A.C.S.R.
3. A 115-13.8 KV substation consisting of erection of two 10,000 kva, 3-phase, oil-filled transformers, and necessary bus work, disconnecting switches and fuses for six 13.8 KV, 3-phase circuits. The structure to be furnished by the Contractor for this installation may be either wood or steel.
4. Two 13.8 KV load centers consisting of 3 3-pole, gang-operated pole top mounted load break switches and bus work arranged to receive two incoming 13.8 KV, 3-phase circuits. The structure will be wood.

Plans, specifications and Proposal Forms for the work are on file in the Authority's Office and in the offices of the Engineer, Uhl, Hall & Rich, 230 Congress Street, Boston 10, Massachusetts, and the Hydro-Electric Power Commission of Ontario, 620 University Avenue, Toronto 2, Ontario, and may be inspected by prospective bidders during office hours.

Plans, specifications and Proposal Forms may be obtained from the Power Authority of the State of New York, 270 Broadway, Room 1300, New York 7, New York, after November 26, 1954 upon application and prepayment of a fee of Twenty-five ($25.00) dollars, no part of which will be refunded.

Bids must be made upon the proposal forms included in the Contract Documents. Each proposal must be accompanied by draft or certified check payable to the order of the Power Authority of the State of New York for the Sum of $15,000.00.

The right is reserved to reject any or all bids.

W. S. CHAPIN
GENERAL MANAGER

TRANSFORMERS

FOR SALE

3—1000 KVA Moloney 13200-2300/4000Y
3—1000 KVA Mol 11500-2400/4160Y
3— 833 KVA G-E 35000—480
3— 500 KVA G-E 26400—240/480
5— 333 KVA W-H 38000-7200/12470Y
3— 333 KVA G-E 33000-2300/4000Y/6900/-11950Y
3— 333 KVA G-E 33000-2300/4000Y
3— 333 KVA Mol 7200/12470Y-2500/4160Y
3— 333 KVA W-H 6600-230
3— 150 KVA G-E 19050/33000Y-2540/4000Y
5— 150 KVA G-E 7200/12470Y-240/480
3— 100 KVA G-E 33000-6900/11950Y

Many other items in stock.

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
Cincinnati 27, Ohio
40 Years Dependable Service

OPPORTUNITIES!

in

New and used equipment recently released from service by a number of electric and gas utility companies

POWER PLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
SUBSTATION EQUIPMENT
TRANSMISSION LINE MATERIALS

Send for new list, . . . to

EBASCO SERVICES INCORPORATED
(APPARATUS EXCHANGE)
Two Rector St., New York 6, N. Y.

ELECTRICAL WIRE AND CABLE

—Your Best Source—
- for every industrial and power application
- Odd lengths—long and short—reasonably priced
- **LARGEST STOCK IN MIDWEST**

Let us quote on requirements—send your inquiries
We'll also buy your Surplus
Branch Offices:
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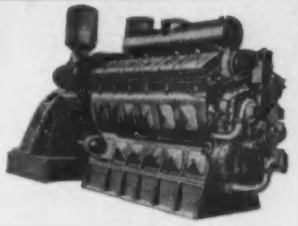
UNIVERSAL Wire and Cable Co.
2662 N Clybourn Ave., Chicago 14, Ill.
SAntgate 7-4777 Code: UNIWIRE

DIESEL POWER

IMMEDIATE SHIPMENT
- **PURCHASE OR RENTAL**

UNIT CAPACITIES—10 TO 2475 KVA
A.C.—50 AND 60 CYCLES
- **ALSO D.C. UNITS**



A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1180	Worthington	SEH-8	1685	360	320	Superior	60E-6	460	450
1136	Fairbanks Morse	38D	1600	720	300	General Motors	8-268A	450	1200
1100	General Motors	16-278A	1600	720	250	Clark	GD-4	375	360
750	General Motors	12-567	1080	720	200	General Motors	8-268A	350	900
700	Worthington	EE-8	1000	327	175	General Motors	12-71	275	1800
600	General Motors	12-567	860	600	150	Worthington	CC-6	225	450
500	General Motors	8-567	720	720	150	Buckeye	80	240	600
500	Alco	6-12 1x13T	750	600	145	Fairbanks Morse	32E14	220	300
350	Baldwin	VO-6	510	450	100	General Motors	3-268A	150	1200
320	Enterprise	DSG-6	460	450	60	General Motors	6-71	90	1200

A. G. SCHOONMAKER COMPANY, INC.
DIESEL DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

1606 53rd ST. NORTH BERGEN, N. J. N.Y.C. Tel. UNgacre 5-3227 N. Y. Tel. UNion 3-7600

TRANSFORMERS 60 CYCLE

2—3750 KVA G.E.—3 ph. (new) type OA outdoor 26,400 V., pri. 4360 V. sec.
1— 750 KVA G.E. type HT, 3/60, 4150-230V.
2— 750 KVA, G.E., type H, 1 Ph., 4150-230V.
1— 100 KVA, Wagner, 1 Ph., 460-115/230V.
1— 50 KVA G.E., Type H, 460, X115/230.
1— 50 KVA Whse. New. OISC, 2400/4160Y. X240/480.
3—37½—KVA G.E., Type H, 2400/4160, X 120/240.

SYNCHRONOUS MOTORS

1— 300 H.P., Elec. Mach., 720 RPM, 3 Phase 60 cyc., 2200V T E F Cooled Outdoor service.
1— 150 H.P., G.E., 1800 RPM. 220V. 3/60.
2— 150 H.P., Al. Chal 360 RPM. 440V. 3/60.

MOTOR GENERATOR SETS

1—1000 KW Whse., 600 V. 720 RPM, 4150 syn.
1—1000 KW G.E., 600 V. 514 RPM 4000 Syn.
1— 750 KW Whse., 275 V. 720 RPM. 4000 Syn.
300 G.E. 250 V. 1200 rpm. S.R.
1— 200 KW Whse., 250 V., 900 RPM, 4000V. Syn.
1— 150 KW G.E., 125/250V. 1200 RPM 2300 Syn.

SLIP RING MOTORS

2— 300 H.P., G.E., M 1200 RPM 2400V.
1— 400 H.P., West., CW. 450 RPM. 550V.
1— 250 H.P. West., CW. 600 RPM. 440V.
1— 200 H.P., West., CW. 600 RPM. 440V.
3— 150 HP., Al. Ch. 1800 RPM. 2300V., 3PH. 60 Cy.

Large Stock of A.C. and D.C. Equipment

SUBSTATION EQUIPMENT

TRANSFORMERS

QU.	KVA	MFR.	VOLTAGE
1	10000	A. C.	66000—33000, 3 ph.
4	2500	Mol.	66000—13800
3	800	Kuhl.	66000—480
3	667	Kuhl.	66000—480
4	500	West.	69000—6900
3	400	G. E.	66000/33000—2300/4160
3	333	Stand.	69000/34500—7200/12470 Y
3	200	Pitts.	66000—2300
3	1500	Wag.	44000—6900
3	1250	A. C.	44000/11500—460
4	150	West.	44000/33000—2300/6900
3	75	West.	44000—7200/12470 Y
3	5000	G. E.	38100/66000—6600
1	3750	Penna.	38030/65865 Y—13800, 3 ph.
4	3333	G. E.	38100/66000 Y—33000
4	3125	Mol.	39900/66000 Y—26600/46000 Y
6	2000	Mol.	38100/66000 Y—13800
3	3333	G. E.	33000/11000—2400/7200
4	333	G. E.	34500—13800/23900 Y
3	200	A. C.	34500—2400/7200/12470 Y
3	75	Wag	33000—240/480
3	1250	G. E.	26400/13200—2400
4	1500	A. C.	25400/44000 Y—6900/13800
4	450	A. C.	25410/44000 Y—13280/23000
3	100	G. E.	22000—7200/12470 Y
1	2000	G. E.	13800—2300, 3 ph.
3	667	G. E.	13800—2300
1	600	Stand.	13200—2300, 3 ph.
1	450	Penna.	13200—2400, 3 ph. ASKAREL
6	200	G. E.	13200—230/460
4	167	G. E.	7200/12470 Y—2400
3	125	A. C.	6900—2300
3	37½	G. E.	6900—230/460
4	150	G. E.	4800/2400—240/120
2	100	G. E.	4800/2400—240/480
1	3000	G. E.	4160—480/277 PYRANOL
3	333	G. E.	2400/4160 Y—460
3	250	G. E.	2300/4000 Y—115/230
3	200	West.	2400—240/480
3	150	West.	2400—230/115
3	150	West.	2400/4160 Y—240/480
1	100	G. E.	2300—575, 3 ph.
6	50	West.	2400—114/228 DRY TYPE
1	50	G. E.	2400/4160 Y—240/480, 3 ph.

ALSO:—FREQUENCY CHANGERS
MOTOR GENERATOR SETS
SYNCH. CONDENSERS
OIL CIRCUIT BREAKERS
FEEDER REGULATORS, etc.

BREW, WOLTMAN & CO., INC.
52 Church St., New York 7, N. Y.

RE-NU-BUILT
GUARANTEED

ELECTRIC POWER EQUIPMENT

MOTOR GENERATOR SETS
3 ph., 60 cy.

Qu.	KW	Make	Speed	DC Volts	DC Volts
1	3000 3U	G.E.	514	600	4000/13200
2	2000/2400	G.E.	450	250/300	2300/4600
2	2000	G.E.	514	600	6600/13200
1	2000	G.E.	600	666 25 cy.	11000
2	2000	G.E.	450	600	2300/4600
1	1500	C.W	514	115	4000/13800
1	1500	G E	720	600	13200
1	1000	G.E.	900	260	4100/6900
3	1000	G.E.	720	600	2300/4600
2	750	G.E.	720	275	2300/4600
1	500	Whse.	1200	125/250	2300
1	500	Whse.	900	250	440
1	500	G E.	720	125	2300

TURBO GENERATORS

Qu.	KW	Make	Desc.
1	4000	G.E	Condensing—423 lbs—750° F T.T.—Surface Condenser 3/60/2300-4000 v with exciter
1	1000	G.E.	Non-Cond—190 lbs-2400-3-60
1	1000	Moore	Condensing — Extraction — 190 lbs., 2400 3-60—Surface Cond.
1	750	G.E.	Condensing—265 lbs., 440-3-60 Built 1944
1	500	Moore	Non-Cond—150/200 lbs., 5/35 lbs. B.P., 480-3-60 Dir. Conn. Exciter
1	300	G.E.	Non-Cond—160/175 lbs., 5/10 lbs. B. P., 480-3-60

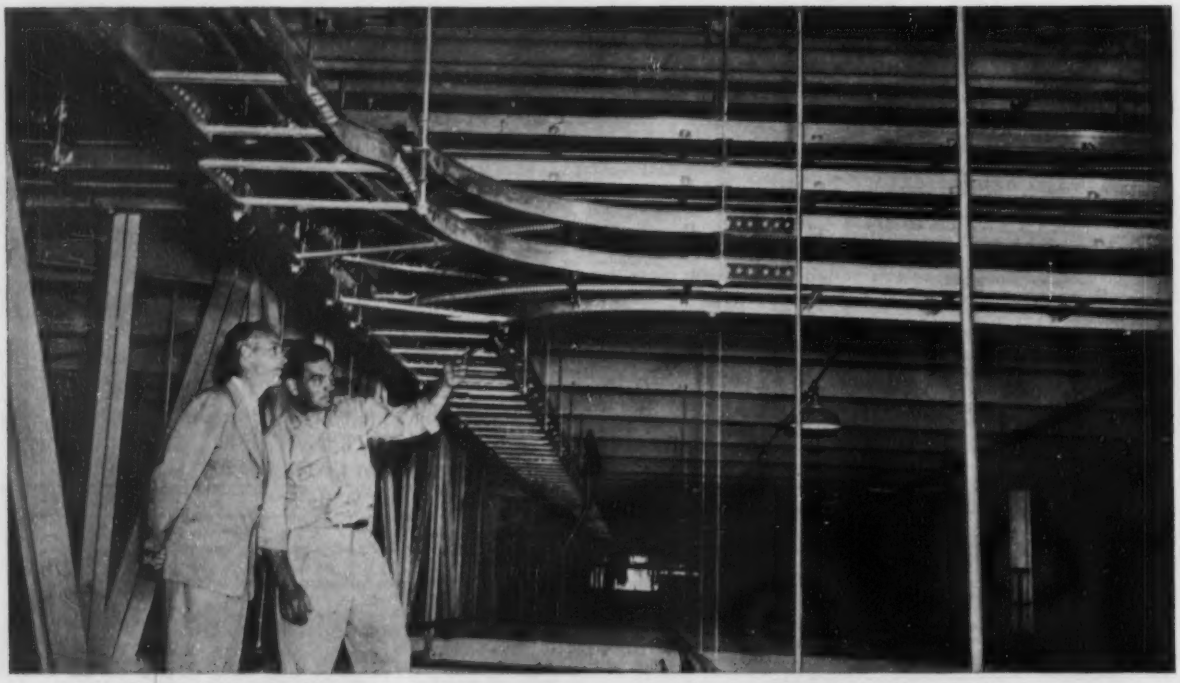
FREQUENCY CHANGERS

Qu.	Kva	Make	Cycles	Voltages
1	13900	Whse.	60/25	13200 x 13200
1	3750	G.E.	60/25	4150/2400 x 2400/4150
1	3125	G.E.	25/60	4150/2400 x 2400/4150
2	2500	G.E.	25/62½	2300 x 4160
1	1250	G.E.	25/58.3	4600 x 2300
1	625	A.C.	25/60	11000 x 2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
1	5000	Whse.	3	33000x26400/13200
1	2500	Whse.	3	26400/13200 x 480
3	2000	G.E.	HVDDJ	1 66000 x 13800
3	667	G.E.	HD	1 13800 x 2300
3	1250	G.E.	HVDDJ	6600/550
3	1000	G.E.	HVDDJ	1 2200/480

BELYEA COMPANY, INC.
51 Howell Street, Jersey City 6, N. Y.



Part of the General Electric V-c interlocked armor cable secondary feeder system in the Painesville, Ohio, plant of Industrial Rayon Corporation. Each cable is individually protected and individually accessible.

V-C INTERLOCKED ARMOR CABLE SYSTEM CUTS COSTS, INCREASES CIRCUIT RELIABILITY

INSTALLED COST SAVINGS

Many industrial concerns are taking advantage of the economies of a G-E V-c interlocked armor cable system. Industrial Rayon Corp., for instance, found that a G-E cable system was by far the most economical means of secondary distribution. Costs were low because the flexible interlocked armor cable could be installed fast —indoors or outdoors, around corners, over beams, and in long runs. The cable was installed on low-cost aluminum racks hung from the ceiling, and spliced with simple mechanical joints. As a result, engineering and installation time was cut.

INCREASED RELIABILITY

Circuit reliability is increased because each cable is individually protected, and is less apt to be affected by any fault that may occur in another circuit.

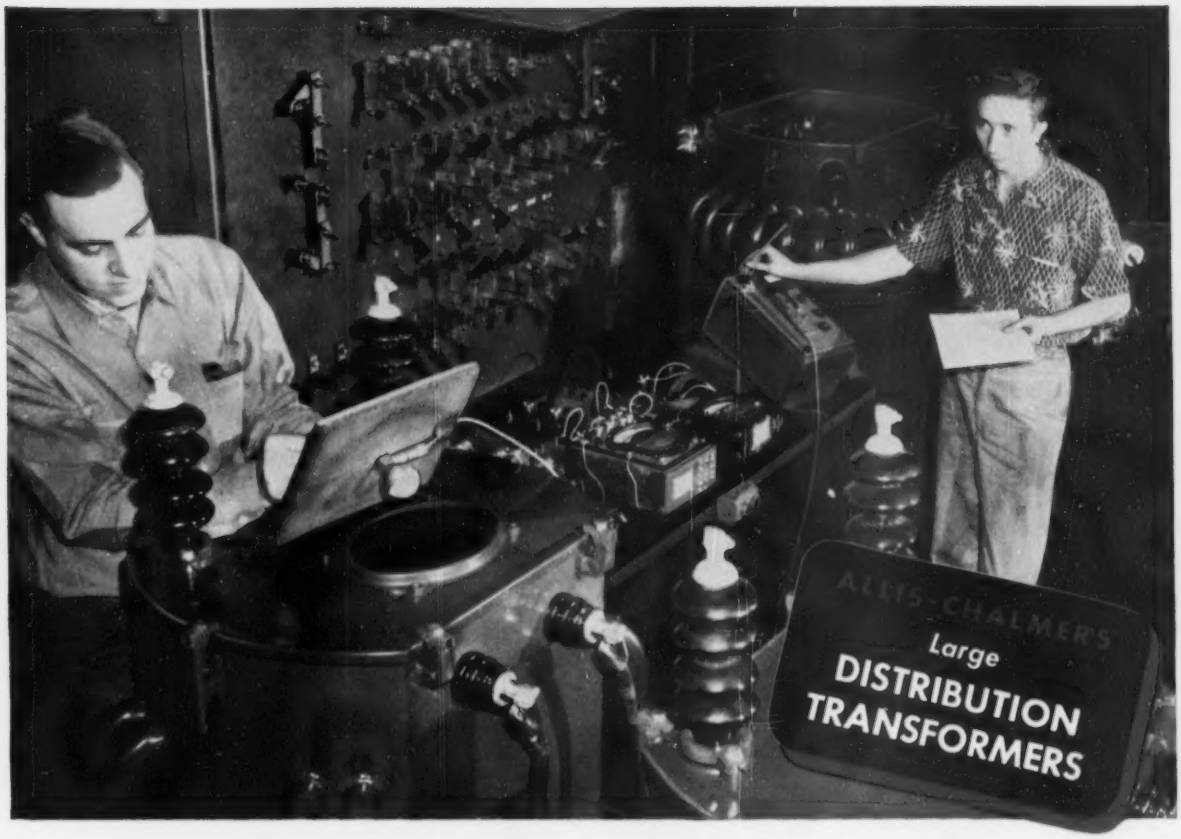
FOR NEW PLANTS OR OLD

Whether you're planning a wiring system for a new plant or modernizing an existing system, G-E varnished-cambric interlocked armor cable offers you reliable service with savings in both time and cost. Consult your G-E cable specialist, or write Section W149-1127, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

The cable bends easily. Corners and projections present no installation problem.

Progress Is Our Most Important Product

GENERAL ELECTRIC



Sound Levels Checked

by PRODUCTION LINE sound level testing

As distribution systems grow, distribution transformers in residential areas are getting larger. It's more important than ever to keep noise levels low.

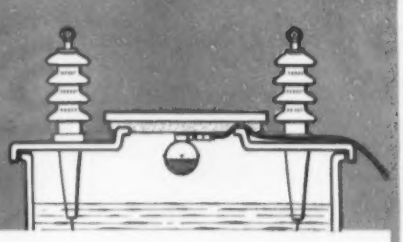
Since 1951, Allis-Chalmers has been conducting *production line* noise level checks on large distribution transformers. As a result, Allis-Chalmers has consistently delivered uniformly quiet transformers.

Sound level research, too — In cooperation with sound experts, Allis-Chalmers engineers are conducting research in magnetostriction in electrical core steels and resonance in core structures of all sizes and ratings. They are testing the effects of clamping pressures and anchoring of core and coil assemblies. Allis-Chalmers operates a separate, specially designed sound laboratory with extensive equipment for sound level research.

The result is a complete line of transformers that helps utilities build good will. If you would like more information on this or any other Allis-Chalmers transformer development, contact the A-C office nearest you or write Allis-Chalmers, Milwaukee 1, Wis.

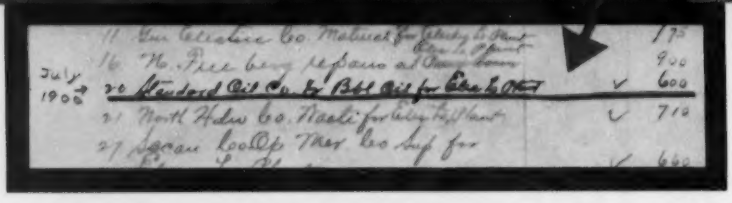
A-4366

How It's Done



Here's how noise checks are made under normally noisy manufacturing conditions: The air space in the transformer tank above the oil becomes a miniature sound room. A microphone is suspended into this space and it is sealed from external noises. The microphone picks up noise when the transformer is energized. Noise level value is recorded and checked against established values.

ALLIS-CHALMERS



Engineer Carl Barr and O. P. Sather, Standard Oil Chief Lubrication Engineer, are inspecting the old log book showing the first purchase from Standard Oil was made way back in 1900.

"Our records show Standard's been putting in at Two Harbors for 54 years!"

■ The operating log in the power plant of the city of Two Harbors, Minnesota, shows that on July 20, 1900, a half barrel of engine oil for use on a steam engine was the first purchase made from the Standard Oil Company. Since then, page after page of the log shows Standard has been filling all of this power plant's lubrication requirements.

Carl Barr, chief engineer for thirty years, says: "When we bought our first turbine in 1937, we knew that NONPAREIL Turbine Oil was what we wanted. NONPAREIL's performance proved that we were right. Since 1937 we've added and replaced turbines and always installed NONPAREIL. We've never had any trouble with governors. There's been no foaming or rusting . . . no deposits in the oil coolers. In fact, with NONPAREIL on the job we've had no malfunctions of any kind!"

For guaranteed lubrication in *your* turbines—new or old—fill with NONPAREIL Turbine Oil. With each fill of NONPAREIL goes a written guarantee stating that the oil will last as long as the turbine and will maintain a neutralization number below 0.15 mg. KOH/gm. Call the Standard Oil lubrication specialist near you or write: Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

NONPAREIL
TRADE MARK
Turbine Oil

STANDARD OIL COMPANY

STANDARD *(Indiana)*